THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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(J. A. BERLY'S).

1911 EDITION

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MINERS' AGENTS AND ELECTRICITY.

THE cause of the regrettable disaster at Hulton Colliery in December last has been decided upon. We do not say that the cause has been ascertained definitely and beyond question, as we believe the verdict at the Coroner's inquest was more or less open, and the report of the Government inquiry has not yet been issued, but even in this we doubt if any definite indication of the actual point of ignition will be given.

Both the inquiries mentioned above, however, were attended by representatives of the Miners' Federation of Great Britain, and Messrs. Robert Smillie and William Straker, who attended the Government inquiry, have prepared a report which is to be submitted to the next meeting of the Executive Council of the Federation. In this the miners of Great Britain will be told that their *representatives* "*are satisfied* that the explosion originated in No. 1 heading, North Plodder seam, and was *due to an electric spark from the conveyor switch* coming into contact with gas or gas and coal dust." There is, unfortunately, no doubt that this statement will be accepted as gospel by the great majority of working miners, and therein lies the pity of it all, as in all the applications of mechanical aids to mining none is of more value or may be said to be a better friend to the collier than electricity.

Those who have followed the evidence as reported at the inquiries would, we think, find it hard to say with the same directness as these gentlemen that the explosion was caused by this switch; even Dr. Thornton, their expert witness, could not positively say that the switch did or would spark sufficiently to fire the gas, whilst the evidence of the colliery electrician, which was more or less supported by that of Mr. Nelson, H.M. Electrical Inspector of Mines, was to the effect that it was absolutely impossible. It is true Dr. Thornton did not agree that the switch would not give off either a flash or a spark, and he quite rightly pointed out that it was possible for this to occur without any evidence being observable on the interior lining of the switch case, but this practically formed the whole of the conflict of evidence between these witnesses. Further, we must remember that the switch was in a metal flame-proof case filled with oil, and Dr. Thornton could not but admit that the switch could only spark when there was an insufficiency of oil in the case. It was just this point which was in dispute, as it was definitely ascertained that there was an insufficient quantity of oil when the switch was examined, but the inspection took place at some distance from the point where it was fixed, and it was thought some of the oil had been spilt in its removal. But even assuming that at the time of the explosion there was an insufficiency of oil, and that a flash on breaking the switch did occur, it is still questionable if it were even then possible for the spark to ignite the gas, as it would be more or less cooled in finding a path between the flanges or joint of the cover and the box! Yet in spite of all this, two men, without any technical training or electrical knowledge whatsoever, have the impudence—we can call it nothing else—to assert that this

terrible disaster was caused by a spark from an electric switch. As a matter of fact, it is much more likely that the accident was caused by a faulty lamp, or through a workman tampering with one, as it was proved in evidence that this was not an unusual occurrence. What, then, is the reason why electricity is assigned as the cause? Is it because the constant clamouring of the men against the use of electricity demands that some definite reason for their objections should exist—no matter on what grounds, fair or unfair, such a reason is founded? It looks like it!—but at the same time we sincerely hope we are mistaken, and that the miners of this country will not try to hamper further the management of our collieries in the endeavour to introduce electric power.

As we have already said, electricity is the best friend the working miner ever had, and the sooner he recognises this fact the better. It will be the means of reducing the more arduous portions of his toil; it will increase the amount of his production, and though his price per ton may not be so large, the fact that he will be enabled to increase his tonnage—and to do so with a less amount of physical energy—will enable him not only to maintain his present daily earnings, but to increase them. The extended application of electricity will, further, be the means of keeping some seams open which otherwise would undoubtedly be closed. As to the danger—inherent or otherwise—we have said over and over again that, with proper care and the application of common-sense methods in design and application, there is no danger, and, in fact, it seems to us a great pity that the Committee, when drafting the proposed new rules, went so far as to prohibit its use in a gassy part of a mine. The question, we think, might have been safely left to the owners and management of the mines, as none care to run an unnecessary risk, and the door was at least left open to the mining engineer and the electrical manufacturer to devise some means to get over all such difficulties.

In conclusion, we trust that the miners' representatives will realise the great advantages to be gained from the extended use of electricity, and that they will put these before their followers, and try to persuade them to be a little more amenable to reason.

Tests for Insulated Wire.

The Electrical Department of the city of New York has recently issued a set of revised electrical regulations, which include several new and more drastic tests for insulated wires. The rules provide that the insulation shall be of rubber or other approved homogeneous compounds, and specify a definite thickness for each size of wire. The test for the elasticity of the insulating covering provides that all wires smaller than a No. 7 must be capable, after the braiding has been removed, of being wrapped five times around a cylinder of given size without injuring the insulation; the diameter of the cylinder being fixed at twice the diameter of the insulated wire for Nos. 8, 9 and 10, and at the same diameter as the insulated wire for No. 11 and smaller sizes. We do not think that this test should be difficult to pass with newly manufactured wires, but we notice that the rules provide that all tests shall apply to wires, not only at the time of manufacture, but also up to, and including, the time of installation; and it should, therefore, weed out some of the poorer class of wires, which have a great tendency to harden and become brittle when kept for some time before being used.

To provide against too soft an insulation, the rules stipulate that the insulating covering must withstand the following tests without being damaged by crushing. In the first test a short length of wire has the insulation removed at each end, whilst the remainder of the length is left intact—that is, with its braiding still on. One end of the copper wire is fixed to a clamp on a small cylinder, whilst a 10-lb. weight is attached to the other end of the copper wire. The cylinder is then revolved 10 times, wrapping the sample in a close even coil around the cylinder. With the tension left on the sample, it is then immersed in water for 24 hours; and it is stated that immediately after this, and while still immersed, it shall be subjected to 1,500 volts alternating pressure for one minute, and shall show an insulation resistance equal to at least half that required by the test formerly provided at 100 volts. It is difficult to see how this electrical test is to be applied whilst the sample is still immersed in water, as the two ends of the sample are bare; and further, the measurement of the insulation resistance of a short length (about 20 in. is mentioned as a suitable length) of wire presents considerable difficulty, even when facilities exist for adopting every precaution for preventing surface leakage at the ends.

In the second test the braiding is carefully removed from a portion of the sample, and the copper wire is connected to one terminal of an electric circuit, of which a testing tool forms the other terminal. The tool edge is sharp, and the sides of the edge form an angle of 90° with each other. The voltage of the electric circuit must be at least 100 volts alternating, or 140 volts direct, and its resistance must be at least 1,000 ohms. The portion of the sample from which the braiding has been removed is then placed on a flat surface, and the tool edge, placed transversely across the sample, is pressed down on to the insulating material with a pressure of 5 lb., which is maintained for a quarter of an hour. During this period the tool edge must not sink through the insulation sufficiently to touch the copper wire and complete the electric circuit. This test appears to us to be a very severe one for small wires, and puts a greater strain on the wire than it should ever be subjected to when being fitted up by competent workmen; but we understand that the new rules are approved by the manufacturers of good class wires in New York, and it is possible, therefore, that the last mentioned test is not so drastic as it appears to us, who have not yet had an opportunity of trying it on samples of wire.

The I.E.E. Wiring Rules.

The wiring rules of the Institution of Electrical Engineers, being so widely adopted by electricity supply authorities and insurance companies, are necessarily of direct interest to a very large number of electrical men, and the issue of a revised version, as announced in our last issue, will command their attention. In order to realise the changes which have been made, a detailed comparison of the new with the old regulations is necessary, upon which we shall not embark at the moment; but in general it appears that the trend of the alterations is towards relaxation of the stringency of the rules, no doubt with the object of reducing the cost of wiring. The purpose is commendable, provided that the practice is not carried too far; safety must always be the paramount consideration. Expediency is also an important factor, and no doubt the Standing Committee on Wiring Rules has had an arduous task in steering a course between conflicting views and interests. Extracts from the Board of Trade Regulations, and the whole of the Home Office Regulations for factories and workshops, have wisely been included in the present edition, which therefore forms a very complete and useful guide to contractors and others concerned in installation work.

Gas Producers.

Any pronouncement on the subject of gas producers from Mr. J. E. Dowson must necessarily command respect; a perusal of the abstract of his recent paper before the Institution of Mechanical Engineers, which we print elsewhere in this issue, will engage the reader's interest as well, for the author adduces evidence to show that he has solved the long-standing difficulty of the complete gasification of bituminous coal in a simple type of producer.

It has long been recognised that in theory and practice the gas producer has lagged far behind the gas engine, which, with the aid of blast-furnace gas, has been developed to a high degree of mechanical perfection. It is true that the large gas engine is still an expensive and complicated machine, and that there is abundance of room for its improvement in the direction of cheapness and simplification, features which the small gas engine already possesses to a marked degree; but it is a thoroughly practical, efficient and reliable prime mover. Hitherto it has had to depend almost entirely upon the waste products of blast furnaces

and coke ovens for its supply of gaseous fuel, and as we have hardly reached the stage sometimes jestingly anticipated, at which such furnaces will be constructed primarily for the production of gas, with iron and coke as by-products, the scope of the large gas engine has been limited by wholly extraneous considerations.

However, in view of the results announced by Mr. Dowson, there is ground for hoping that in the near future the necessity of employing costly anthracite will be obviated, and that it will be found possible and practicable to use bituminous coal at one-third the price. The new producer apparently generates gas which is as free from tarry vapours as that derived from anthracite, and it can be worked successfully in both large and small sizes.

There is little to be feared from the new producer by the electrical industry; on the contrary, it may, and should, be found of great service for electrical generating stations, as well as in factories where gas is required for heating, and in private electrical installations which are unable to obtain electricity from an outside source. But the low prices at which electrical energy is now supplied for motive power, and the convenience and economy of the electric motor, place the latter beyond the reach of competition for driving purposes.

Foreign Electrical Trade in April.

Seeing that the month of April, 1911, included three working days less than the corresponding month of the year 1910, it is very satisfactory to find that the decrease in electrical exports is no more than £1,725. This year's figure is £205,358, against £207,083 for April last year, and if one were to add an average three days' business, the increase would be quite substantial. It seems to be an exceedingly easy matter to misunderstand the official figures. Last month, for instance, when the electrical export figures for March were announced, there was an apparent decrease compared with the same month of 1910, and at least two of our contemporaries fell a-brooding over so "disturbing" an occurrence. A closer study would have shown that, comparing like with like, there was nothing "disturbing" at all about it, that there was really reason for rejoicing at a good electrical export advance, if it were remembered that one exceptional telegraph cable export of March, 1910, accounted for more than half-a-million sterling. Our own analysis of the official figures, appearing in the Electrical Review for April 28th, showed that the *general business* for March constituted a record. Disturbing feature, indeed!

Down to date, the electrical exports of the current year have been £902,680, as compared with £1,318,079, including that special item, that is, a fall of £415,399. One other large submarine cable item in any later month may suffice to turn the fall into a substantial rise. While these exceptional items are of course very welcome as indicating greater activity in a special class of factories, neither their presence nor their absence is a guide to the volume or value of the general run of electrical manufactures exported. No doubt our readers hardly require this to be pointed out to them, notwithstanding the error into which some writers have fallen. The electrical goods and apparatus imported during the past month fell from £112,341 to £110,624, a decrease of £1,717, but for the four months the total was £468,174, as compared with £460,718 in 1910, that is, an increase of £7,456. Machinery of all kinds imported down to date has increased by £568,206, and that exported by £988,940, the imports for the month advancing by £196,144, and the exports decreasing by £121,210.

The Telephone Transfer.

The proposal of Mr. H. Laws Webb, endorsed by the London Chamber of Commerce, that a special Telephone Authority should be set up in preference to transferring the telephone service to the control of the Post Office, continues to attract a great deal of attention and an increasing measure of support. A significant feature of the correspondence which has taken place on this subject in the daily Press is the favourable attitude of commercial authorities towards the project. The fact that the conduct of so simple and profitable a business as the carriage of letters and parcels has been carried on by the Post Office with success, is irrelevant to the question whether the highly technical business of telephony could be successfully administered by the department on commercial lines, has been fully grasped and emphasised by several prominent persons, and the huge deficit on the telegraphs is held up as an example of what may be expected from the telephone service in Post Office hands.

The imperative necessity that capital should flow into the undertaking at the rate of something like 10 millions sterling per annum is also pointed out as an insuperable objection to the administration of the system by a Government department. To consider only the present development, and to ignore the enormous demands of the future, is to adopt a short-sighted view which can only end in disaster to the telephone service, which has not attained to a quarter of its proper development; but a Government Department, under the control of politicians, cannot possibly take that broad view of future requirements which is essential to the adequate development of the service. Moreover, it would be subject to that internal pressure on the part of an enormous staff, with considerable voting power, the effects of which on the postal and telegraph services have already been amply illustrated, and which forms one of the most dangerous and objectionable features of an overgrown civil service.

That the transfer of the service from the National Telephone Co. has been irrevocably decided upon is no bar to the new proposal; there will be no difficulty in placing the control of the undertaking in the hands of the Telephone Authority at any stage. The technical objections raised by the Post Office are also such as the latter would quickly dispose of, were it desirous of facilitating the accomplishment of the scheme.

Engineering Training.

The subject of the education and training of engineers is undoubtedly one of the most important matters that can occupy the attention of our great engineering societies; we are pleased, therefore, to learn that the Institution of Civil Engineers has decided to summon a Conference on the question, to meet at the Institution on June 28th and 29th. The necessity of the Conference has arisen, naturally, out of the conditions laid down for the qualifications of candidates for election into the Institution; having specified the results to be arrived at, and provided means to test the attainment of the standard set, the Council now proposes to deal with the methods of preparation to be adopted with a view to compliance with its requirements.

Fortunately, with commendable breadth of view, the Council has avoided restricting the discussion to the needs of any particular class of engineers; the questions to be discussed are divided into three sections: General Education, Scientific Training and Practical Training, and a number of subjects have been specified for consideration at the Conference, embracing various phases and aspects of the course of preparation necessary for the efficient development of the embryo engineer. A very large committee of distinguished educationists and engineers has been formed; Mr. Alex. Siemens, President Inst. C.E., will preside over the Conference, and the list of vice-presidents, chairmen and vice-chairmen includes the names of men of distinction in all branches of engineering and education. That the Conference will be a success is amply guaranteed by the weight of influence enlisted in its support; and we have no doubt that its deliberations will result in important conclusions and material improvements in the organisation and conduct of engineering training. The present announcement is only of a preliminary nature, and a more detailed statement may be looked for at an early date.

SOURCES OF DAY LOADS FOR ELECTRIC LIGHT AND POWER STATIONS.—I.

By JOHN B. C. KERSHAW.

The managers of electric light and power stations, situated in the centre of manufacturing districts, are no doubt well aware that there are still many untapped sources of a day load in the works and factories located around them.

In too many cases prejudice, or ignorance on the part of the proprietors of these works, is the reason why electrical energy, at cheap rates, is not more largely used for some of the more recent and novel applications that lead to economy in raw or waste materials. The amount of power consumed for many of these applications may be small, but in the aggregate they would represent a power load worth having.

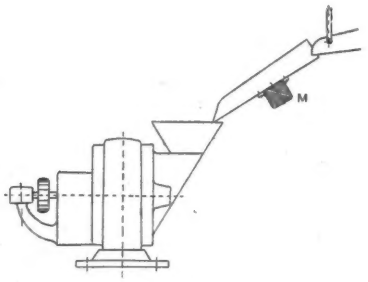

Fig. 1.

In the present article, it is the purpose of the writer to describe an application of the electric current for recovery of iron from the waste materials produced in brass and iron foundries. Every large town or manufacturing district is usually provided with one or more works of this type.

The general principle of the devices of this class is to produce, by means of powerful electromagnets, a magnetic field, within which the material to be treated is brought in a dry and finely divided state. The iron particles, by reason of their magnetic properties, are thus caused to take a different path as they fall through the machine, from that taken by the non-magnetic particles.

The particular application of this electromagnetic method in foundries is to the separation of the iron particles from cupola slag and ashes, from moulding sand, and from other metal borings, filings, turnings, &c.

Tho simplest form of electromagnetic device for this work is shown in fig. 1. The magnet M in this case is placed underneath an inclined shoot, down which the finely-divided material containing the particles of iron descends, and from time to time the stream of waste material is interrupted, the current is cut off, and the demagnetised particles of iron are swept from the shoot into a special receptacle. The defect of this method is that the removal of the iron is necessarily intermittent instead of continuous, and that attention is constantly required to free the shoot from the collected particles. In small foundries where the amount of material to be treated is restricted, however, this is not a very serious defect, and this type of machine is probably the best for use in such cases.

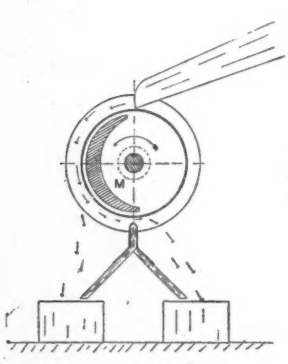

Fig. 2.

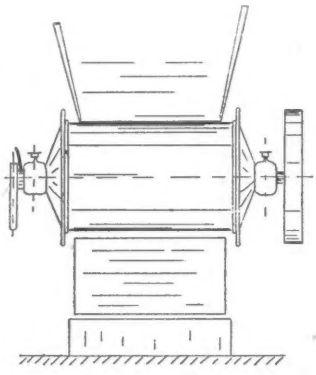

Fig. 3.

Figs. 2 and 3 show a continuous type of iron-separating machine for use in foundries where a large quantity of material is to be treated daily, and where the individual pieces of iron may be of comparatively large size and considerable weight.

The feature of this type of machine is that the electromagnet M contained within the revolving drum is fixed, and that the magnetic field is therefore maintained always on the one side of the drum as it revolves. The magnetic particles and pieces of iron are therefore carried clear of the separating division between the two receptacles, while the non-magnetic material falls directly into the receptacle shown on the left-hand side in fig. 2. Fig. 4 shows another application of this form of rotating drum, there being in this case two electromagnetic separators, in order more effectually to divide the magnetic and non-magnetic particles of the material treated. Fig. 5 shows another method of applying the electromagnetic principle of separation.

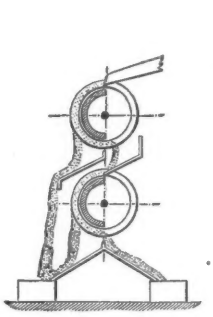

Fig. 4.

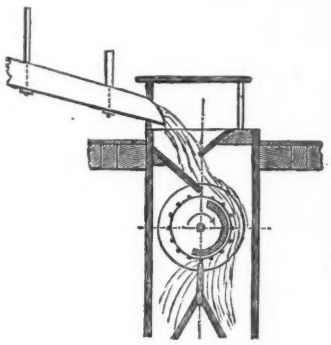

Fig. 5.

Further details of these electromagnetic separating devices for foundry use can be obtained from an article contributed by H. Hermans to the *Elektrotechnik und Maschinenbau*, January 29th, 1911.

In summarising the advantages of these new methods of treating foundry waste, the author states that it must be clearly understood that the adoption of electromagnetic devices for treating waste material containing iron will only pay in those foundries where the value of the iron recovered (or of the waste material free from iron) is greater than the running and fixed charges of the installation. Cupola slag and ashes contain on the average 10 per cent. of iron; moulding sand, 6 per cent. Taking these percentages as the basis of the calculation, it is a simple matter to estimate what will be the total value of the recovered iron in any particular foundry, and what expenditure may be safely incurred upon an electromagnetic machine for dealing with the products containing iron. In brass foundries the problem is different, for here the value of such a method lies chiefly in the ease and completeness with which brass filings, borings, and turnings, &c., may be freed from the admixture of iron, which sometimes greatly reduces their value. In the majority of cases it will, therefore, pay to install such machines in brass foundries without any regard to the price to be obtained for the recovered iron.

Electric Cooking.—At the Bradford offices of the Sunbeam Lamp Co., Ltd., last week, three interesting dinners were given in connection with the Electric Cooking Exhibition held during the week. The first was given on Tuesday evening to the Corporation engineers of the district, and was very well attended; the whole of the four-course meal, including coffee, was cooked by a "Tricity" outfit for a total consumption of 5·9 units, or nearly 3d. On Wednesday evening the Bradford contractors were entertained, and on Friday Huddersfield and Halifax contractors. Three very interesting evenings were spent, and after the dinners Mr. Grogan, of the Berry Construction Co., Ltd., gave a short demonstration on "Tricity" apparatus. Mr. Grainger (secretary of the Sunbeam Co.) presided.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Industrial Finance.

I regretted very much my inability to be present at the reading of Mr. Joseph's paper, as I had volunteered to take part in the subsequent discussion. Having since read the paper and report of the discussion, will you favour me with the necessary space in which to make a few comments?

I feel, in common with those who were present, a sense of obligation to Mr. Joseph for having raised this very important question. The paper and discussion seem to me to deal from first to last with effects and secondary causes. It is made clear that German bankers do more for German industries than English bankers do for English industries. The question is, Why? To answer the question, this basic fact must be remembered, that bankers are the outcome of industry, and not industry the outcome of bankers.

If an industry wants help from bankers it must first be profitable, or appear likely to be profitable. This is an unalterable law in every country.

The suggestion that an industrial bank should be formed for the electrical industry loses sight of the fact that the money must either be found by the industry (which the industry is confessedly incapable of doing), or we have to go to the people from whom we already allow that we cannot get it. Even if the philanthropist could be found, either in or out of the trade, to form such a bank to bolster up unprofitable industry, if I may desecrate your respectable and respected columns with racing parlance—what price the bank? 1,000 to 3. No takers.

No, Sir; the kernel of the matter is that the electrical industry is not profitable, while legitimate industrial speculation of every kind in this country is practically at a standstill. Look at the figures given by Mr. Joseph for Siemens and A.E.G., and you will see why *English* bankers send their money through German banks into German industries. The finest bankers in the world know their business.

The reason why the English electrical industry is unprofitable, is the fact that it has never had that freedom from external competition, which is an absolute essential for the establishment of any industry, and without which no great industry has ever been established either in this or any other country.

A. Bruce Anderson.

P.S.—In your recent article on Daylight "Saving" appearing in your issue of April 28th, you make use of the following words:—"Be it remembered that the money paid to the lighting agencies is paid for labour, directly or indirectly—every penny of it—so that any money-saving in this way means a corresponding loss of employment in works, on railways and in collieries."

Would you be kind enough to tell us in what way this argument is not applicable to work sent abroad which might be done at home, even at slightly increased cost?

Battery Economics.

While the matter is still fresh in the minds of your readers, may I trespass a little further on your valuable space? I will endeavour to be very brief.

I believe the difference of opinion which exists about the relative values of boosters and regulating cells is largely due to previous impressions.

The Britisher comes to the question with the sizes of boosters, as hitherto determined for discharge, rigidly fixed in his mind. He compares this with the regulating switches he sees on the Continent, and at once comes to the conclusion that they are about equal in cost, especially when considering the frightful inefficiency of the ordinary type of booster when charging the battery.

But he overlooks the fact that, in following the Continental practice, he must add 20 per cent. additional cells to his battery, and will now require a booster, for charging purposes alone, which is big enough (if made triple-parallel) to deal with his discharge.

What, then, is the objection to using this booster for the discharge? It cannot be on the score of cheapness, for the cost with the booster alone is less than one-third of that with the combined arrangement.

The objections alleged are two:—(1) That the switchgear is more complicated. This is due merely to insufficient information having been given in the paper; for the use of large "selector" switches has been adopted, within my own experience, on some of the heaviest direct-current generator panels in the kingdom for many years with never the least trouble; and the switches would not be touched from the beginning to the end of the discharge; (2) that useful current at time of peak is taken up in driving the booster. This is quite true, but useful current is also locked up in idle cells with the regulator method. A consideration of fig. 4 of my paper will show that, out of 303 cells, a discharge is obtained which is only equivalent to that from 290 cells fully worked, representing a 4 per cent. loss of locked-up current. With the booster arrangement, for the same size of battery, 6 per cent. of the battery current would be taken up by the booster motor, but out of this energy some 4 per cent. is returned to the battery circuit, the actual loss being, therefore, only 2 per cent. Moreover, since the booster only costs about £0·5 per KW., whereas the battery costs about £6·0 per KW., it is obvious that a lot of capital is locked up needlessly in the regulating cells.

It should be mentioned (several speakers having misunderstood this point) that the regulator cells shown in my figs. 9, 10 and 11 are not really regulating cells at all, but are merely for "floating" purposes and carry no heavy currents. They can be done away with, if desired, by employing a small "bucking" booster; but two or three cells are required to compensate for the non-regulating properties of the static booster, where this is employed.

A. M. Taylor.

King's Heath, *May 6th*, 1911.

A Useful Integral.

May I draw the attention of your readers to an integral that is easily remembered, easily rediscovered if forgotten, and of frequent use in engineering problems, viz.:—

$$\int x^m (ax^{m+1} + b)^n . dx = \frac{(ax^{m+1} + b)^{n+1}}{a(m+1)(n+1)}.$$

Although this is so easily arrived at (being derived from the differentiation of $(ax^m + b)^n$ in the same way as $\int x^n . dx = \frac{x^{n+1}}{n+1}$ is derived from the differentiation of x^n), it does not appear to be generally known; for in the latest edition of Mr. Saxelby's excellent "Course in Practical Mathematics" I find that the integration of $x . \sqrt{a^2 - x^2}$ (which is required for determining the position of the centre of gravity of a semicircle) is effected by a long and difficult process involving a double trigonometrical substitution, whereas the application of the above formula at once gives—

$$\int x (a^2 - x^2)^{\frac{1}{2}} . dx = \frac{(a^2 - x^2)^{\frac{3}{2}}}{-1 \times 2 \times \frac{3}{2}} = -\tfrac{1}{3}(a^2 - x^2)^{\frac{3}{2}}.$$

For the special case where $n = -1$, we of course have—

$$\int x^m (ax^{m+1} + b)^{-1} . dx = \frac{\log_e (ax^{m+1} + b)}{a(m+1)}.$$

W. F. Dunton.

Newcastle, *May 4th*, 1911.

Salaries of Shift Engineers in India.

In your issue of March 10th your special correspondent in India remarked upon the advertisement for shift engineers which appeared in *Indian Engineering* of January 28th. The salary, owing to a misprint, was given as Rs. 1,000 (one thousand); this should, of course, have read Rs. 100 per month. The mistake was corrected in the next issue of the paper, and a reference made to it in the "Notes and Comments" column.

Bernard Pontet,
Government Electrical Engineer.

Nepal, *April 12th*, 1911.

I enclose cuttings from Electrical Review and *Indian Engineering*, and wish to point out that I think you must be making a mistake, or, at least, your special (?) correspondent must be. What is the salary per month of the Government electrical engineer, Nepal? Is it Rs. 1,000 per month?

Your correspondent states "that there are probably not yet a round dozen native engineers in India with the required qualifications."

I think he will find that there will be over a round hundred applications with the required qualifications; at least, that is our experience when we advertise in India.

Albert C. A. Ridgway.

Kwala Lumpor, F.M.S., *April 12th*, 1911.

Sag of Line Wires.

Would any of your readers please oblige by given me a practical method of measuring the sag of overhead line wires?

Colliery Electrician.

Daylight Saving.

All your readers are not in accord with your article on this subject or with Mr. Nielsen's letter of April 29th. In neither case is any serious argument advanced to refute those put forward by the promoters of the Bill.

I belong to a public department which adopts the plan of advancing its office hours by one hour from April to September, and am therefore in a position to appreciate the real and practical advantages obtained.

But we suffer from want of synchronism with the rest of the business community. My train times are all upset; I cannot get my morning papers in time to read at breakfast, &c. You are right in suggesting that any statutory action in the matter must make the change compulsory all round, and on these lines the sooner we have it the better. Let those laugh who will.

T. F. Purves.

London, *May 9th*, 1911.

[Our correspondent writes from the point of view of the class whose office hours—in London—are from 10 to 5 or thereabouts, and as we have pointed out, they can readily start their day an hour earlier if they wish. But the great bulk of the population follow a very different time-table, and look at the matter from a different point of view.—Eds. E.R.]

LEGAL.

Alleged Faulty Wiring.

In the course of the hearing of a counterclaim by Mr. George Taylor, of Margery Hall, Reigate, alleging negligent supervision on the part of the surveyors, Messrs. Charles P. Whiteley & Son, of Queen Street, City, in respect of the erection of two houses on the Rock Estate at Reigate Hill, allusion was made before Mr. Muir Mackenzie last week in the Official Referee's Court to the electric lighting arrangements on the premises. Counsel for Mr. Taylor criticised the arrangement of the switches. Instead of the wires being carried through iron or metal tubes, they were (said counsel) carried simply through the plastering. If the wires had gone out of order the workmen—it was said—would have had to break down the plastering to get at them. It was stated that the two houses were erected at a cost of £975 each. These and other allegations of negligence were denied *in toto* by Messrs. Whiteley, and eventually his Honour reserved judgment.

The London Electrobus Litigation.

On May 4th, Mr. Justice Neville had before him, in the Chancery Division, the action of the Reorganisation Control Syndicate *v.* The International Motor Traffic Syndicate, upon a motion by the defendants to vary the minutes of an order made on February 13th last.

Mr. Austen Cartmell, who appeared in support of the motion, reminded his Lordship that the action was brought against the defendant syndicate and the Brighton, Hove and Preston Omnibus Co. in respect of an alleged wrongful sale of certain electric motor-buses and spare parts, and £800 was paid to the International Syndicate in respect of the purchase money. The original judgment did not deal with the spare parts, because everybody at the time thought the spare parts delivered to the Brighton Co. were comprised in a certain list now exhibited to the order. It turned out, however, that the list only included 15 accumulators, whereas 19 accumulators were in fact delivered by the International Co. to the Brighton Co. What the subsequent order was intended to deal with was the spare parts, including accumulators which were not included in the list, and, in fact, belonged to the Reorganisation Syndicate. As the minutes of the order had been given out, it would appear that all the spare parts, including the accumulators, were wrongfully sold, whereas it was only those that were not included in the list that were wrongfully sold. There was also a technical objection to the minutes as given out. The defendant syndicate were given an inquiry on the counterclaim, and the order for the inquiry purported to be made in the action, and not in the action and counterclaim as it should be.

Mr. Ward Coldridge, for the plaintiffs in the action, pointed out that the order only went to what the International Co. sold as mortgagees. What they sold as owners would not come within the scope of the order. With regard to the list, he submitted that his Lordship did not intend to decide that the list was an agreed list, and finally binding on the plaintiffs.

His Lordship said that the list was an agreed list, and the case proceeded on that basis. It was conclusive, and he thought he ought not to leave open the question whether the sale of all the articles in the agreement was wrongful.

Mr. Coldridge pointed out that the inquiry would have to go as to what really were the things included in the list.

His Lordship said that would be left open, but the inquiry was not to include any articles that were in the list. He thought also that it should be made clear that the order was made on both the claim and counterclaim.

The minutes of the order were directed to be varied accordingly.

British Westinghouse Electric Co. *v.* The Electrical Co., Ltd.

(Continued from page 714.)

Mr. Bousfield, continuing his speech, said that an invention must have utility. The combination shown in plaintiffs' specification was not useful because the features in it did not fit into one another at all, and in order to make them useful they had to invent parts which were not shown. In the plaintiffs' lamp the inventor had chosen to limit himself to the electrodes firmly clipped, to simultaneous lowering through the same distance, and to an electrode holder which was pivoted so as to swing under the action of a device acting near the lower end, and he could not therefore be permitted to say that those were not essential things. His (Mr. Bousfield's) submission, therefore, was that one of these features being different in the defendants' lamp, that was sufficient to relieve them from the charge of infringement. Referring to Graham's American specification, Counsel said that if a person were to take it with the common knowledge which they all agreed one would have to use in working out a specification, he could not fail to make a lamp which was indistinguishable from the plaintiffs' lamp. Plaintiffs declared that their invention really consisted of applying a retractile strike to inclined carbons. The lamp with a horizontal strike and inclined carbons was an old lamp, and all that they had done was to say "we want an inclined carbon lamp and we will take the old lamp with horizontal strike and make it retractile." In order to entitle plaintiffs to get any monopoly of the idea of applying the retractile strike or the retractile action to the horizontal strike with inclined carbons, they must have invented, at all events, one practicable way of carrying out the idea. It was clear in this case that plaintiffs had not disclosed that, and the mere fact that it was in the claim and the amending phrase did not necessarily make it a good invention.

Prof. J. D. Cormack was then called, and said he had given considerable attention to arc lamps and arc lighting. In 1902, the date of the Bremer specification, the problem of the retractile strike in lamps with vertical carbons had been completely solved.

Mr. Colefax: It is suggested that in 1902, arc lamps with downwardly-inclined carbons were unknown, at any rate except on paper?—No, there were a few inclined carbon lamps. They had not come into extensive use, but they were known. Flame arc lighting was quite well known in 1902. The whole subject was worked out in 1880 with regard to the effect of different chemicals on the carbons.

So far as a lamp with downwardly-inclined carbons is concerned, is the problem of obtaining a retractile strike the same or different from the problem with a lamp with vertical carbons?—It is the same problem. It was quite possible to have a retractile strike without floating. Floating was not specifically mentioned in Bremer's specification, and at first reading, his own idea was that it was not intended to deal with floating at all. It was quite clear that it did deal with the horizontal swing of the carbon before downward feed.

Looking at the specification and the drawings accompanying it, is the mechanism there described one that was apt to produce a floating of the carbons or not?—If floating were required the mechanism shown in fig. 1 was of the very worst type with the direct approach of the armature to the magnet, and in figs. 2 and 3 the mechanism was of the floating type, so far as the solenoid was applied; but inasmuch as the iron checks were placed on the solenoid, that diminished the floating effect, making it more like a magnet with a direct approach. It was evident that there was no mention of a flame arc lamp throughout Bremer's specification.

Do you see, reading the specification as an engineer, any reason to suppose that Bremer was especially contemplating such lamps?—No reason at all. The construction is equally applicable to an ordinary lamp and to a flame arc lamp. The natural way of making the strike retractile, with downwardly pointing carbons, was to make it in the direction of the arc. Bremer pivoted the electrode holder, which was one sliding downwards as the carbon fed downwards; but in the defendants' lamp that device was absent. The frame and guides moved, and not the carbon holder. A commercial lamp was certainly not described in the plaintiffs' specification. Graham's specification was in most respects similar to Bremer's. In Graham's lamp, which was prior to Bremer's, a floating action was obtained.

Further examined in regard to Crosby's specification, WITNESS described the working of a model in detail, with a view to showing that the action was much the same in principle as that of plaintiffs' lamp. He was also questioned as to Wright's lamp, which specification, he said, showed a very satisfactory device for floating. It was very sensitive, but the downward feed was bad. That arose from the difficulty of adjusting the clutches. Bremer's specification in regard to the adjustment of the clutches was also bad; he had tested it, and found that it was so in actual working.

MR. JUSTICE SWINFEN EADY: Do you say that there is no advance by Bremer in common knowledge in any respect?—Quite so, not in any respect.

Cross-examined by MR. WALTER, WITNESS admitted that the Graham and Crossby specification had never been put on the market, so far as he knew.

Do you know of any other case of inclined carbons at the time of Bremer's specification, in which there was any suggestion of adjustment and movement of the armature as provided in plaintiffs' patent?—I cannot say I remember any such lamp at the present moment.

Reading the plaintiffs' specification, do you suggest that an electrical engineer reading it through would not arrive at the conclusion that a floating action was intended?—Not necessarily. There is nothing there to call attention to it. An electrical engineer with considerable knowledge might endeavour to get a floating action, because it is desirable to get a floating action. An electrical engineer with a considerable amount of ingenuity could make a lamp from Bremer's specification of commercial value. There was nothing specifically mentioned in Graham's specification about floating, but solenoids as equivalent to magnets were mentioned, and that implied the floating action. He agreed that it would be difficult to make a commercial lamp from Wright's specification. He did not agree that flame arc lamps were contemplated in Bremer's specification.

But it was after the date of Bremer's specification that flame arc lamps came into commercial use?—It was about that date.

Is it not true that the defendants have got every single element in the plaintiffs' total combination?—Yes, I think so. The difference is that the electrode swings with the electrode holder, instead of the electrode swinging about its holder.

That is an obvious modification of the plaintiffs' specification?—No, it is an improvement.

Does it enable you to burn more carbon?—Yes, distinctly more; it means the difference between an arc lamp burning five or six hours. Furthermore, the device allows of much better regulation, and defendants' type was superior to the Bremer type in this respect.

MR. BOUSFIELD (re-examining): Was there prior to Bremer's specification a known type of inclined carbon lamp, in which one carbon was pivoted so as to give a horizontal strike?—Yes.

And applying common knowledge at that day, would you have had any difficulty in knowing what you must do to that strike in order to make it retractile?—No.

Having got the idea of taking a type of inclined carbon lamp with carbons pivoted so as to give a horizontal strike, and having got the further idea of making the strike retractile you would still have to work out a method of making the lamps commercially useful?—Certainly, it is entirely a question of working out these ideas, and to do so involved ingenuity.

And in all the plaintiffs' lamps which you have seen, that ingenuity has had to be applied in order to make them commercially useful?—Yes, that is so.

PROF. SILVANUS P. THOMPSON was then called, and said that in 1889 he gave a series of lectures to the Society of Arts on arc lamps. He only dealt with vertical carbon lamps in those lectures, but he specifically said that there were other kinds of lamps to which he did not then intend to refer. As regarded impregnated carbons, they had only come into commercial use during the last eight years, but they were known, and their manufacture was known, described and published at least 30 years ago.

MR. BOUSFIELD: Is the old vertical carbon lamp arranged with vertical strike, efficient for burning flame arc carbons?—Quite efficient; they are considerably used.

How long has the inclined-carbon lamp been known?—Ever since 1870. In 1882 a book was published which devoted a chapter to inclined-carbon lamps, which were then called the V lamps, and illustrations were given in that chapter of the Gerard lamp, which had swinging electrodes and a horizontal strike. In 1900 nine-tenths of the lamps had a retractile arrangement. He did not think there was anything in Bremer's specification which was designed specially to meet the case of flame arc carbons.

Would invention be required to produce a lamp from Bremer's specification?—Yes, a great deal of small inventions.

But taking the different parts of the combination separately, they are all old?—That is so.

Do you get any help from Bremer's specification which would lead you to make in detail the successful combination which you have got in the "Excello" lamp?—Such a lamp contains various details which are not in Bremer's specification. For instance, the arrangement for blowing the flame downward is not contained in Bremer, and that is a most important thing in these lamps.

Questioned in regard to Graham's and Crossby's specifications, WITNESS said that, in making lamps from them, if a man worked to get an ordinarily good adjustment, he must necessarily get a floating action. In order to get that, he must also have an oblique approach. He had experimented with models of Graham's specification, and he found, on testing them, that they did undoubtedly produce a floating action. He thought Graham's specification embodied a very good starting point from which to construct a practical lamp for burning impregnated carbons. When a lamp "pumped," the almost universal remedy was a dash-pot, and dash-pots were made in 1879, if not earlier.

Questioned with regard to Wright's specification, WITNESS said he had seen a model made from that specification working. One carbon was rocked by a shunt and a series-wound magnet, and the result was to produce a most excellent floating arrangement. It was a retractile horizontal strike, worked by the very best system of mechanism.

Cross-examined by MR. GRAY, WITNESS said he did not agree that in the previous action his evidence was to the effect that there was nothing at all in Bremer's specification. It was an attempt to make something new from details which were old. No downwardly pointing flame carbon arc lamp was in existence in this country before Bremer's specification, but there were a few types of inclined carbon lamps which did not burn flame carbons. There were no specifications existent of inclined carbon lamps with a horizontal feed before Bremer's specification.

Further cross-examined by MR. GRAY, PROF. THOMPSON said he understood what was meant by "floating," but he was not sure that counsel did.

What, in your opinion, is "floating"?—When you have a solenoid or electromagnet of proper design, the movement of the core of the armature being controlled by gravity or a spring, shall be such that there are intermediate positions of equilibrium which the armature or moving part can take up between its extreme positions. That is what is meant by floating.

Re-examined by MR. BOUSFIELD, WITNESS said, owing to their superior operation in practically every arc lamp to-day, there was an arrangement of solenoids with plunger cores, or electromagnets with oblique approach.

MR. ANDREW FORBES, mechanical engineer, of Hampstead, proved to making the models of lamps produced from specifications of Graham, Wright &c., supplied to him by Prof. Cormack. Witness had no consultation with anyone as to the making of the models, and he was not conversant with arc lamp practice.

MR. GEORGE MILLS, mechanic, of Beaumont Road, Tottenham, said he received instructions from Prof. Cormack to make certain parts for the models in question, and he assisted Mr. Forbes in the matter.

MR. COLEFAX then proceeded to sum up the case for the defendants. He submitted that the case which had been presented to his Lordship was entirely different from the facts which were before the Court of Appeal. There was very little to support the contention that the specification of Bremer was well-nigh the foundation of flame arc lighting. In Bremer's specification not only was there not one word about flame arc lamps, which one would have expected to find if that was Bremer's object, but it went further than that—other difficulties which were admitted on both sides as underlying flame arc lamps were in no way clearly and specifically alluded to in the specification. If floating were contained in the plaintiffs' specification, then he submitted that defendants' case upon insufficiency became overwhelmingly strong. If, on the other hand, floating was not claimed in the specification, then defendants' case upon insufficiency became overwhelmingly strong. In the specification there was a good deal which pointed to Bremer never having had the idea of floating in his mind at all. It was defendants' case that common knowledge would have provided a means of getting floating, whilst Bremer had actually given directions in his specification, which were not only inconsistent with floating, but were entirely bad from that standpoint. In fact, the specification was an impediment rather than a help to any one who was going to try and carry out Bremer's alleged specification.

MR. JUSTICE SWINFEN EADY: How far do you go; do you say that Bremer's specification does not show that he intended that one electrode should approach and recede, that is to say, that the arcs should shorten and lengthen without there being a downward feed, or quite independently of the downward feed movement?

MR. COLEFAX: I say it certainly does not show that you should have movement independently of the downward feed. Even if he does intend to have such a movement independent of a downward movement, he does not contemplate that he is going to have floating; that is to say, a lamp so constructed, that in working it will always adjust the irregularities of the carbon.

MR. JUSTICE SWINFEN EADY: It comes to this, does it not, that in the opinion of Prof. Cormack as regards Bremer's invention, or as regards his specification, there is no advance whatever on what was known to the trade, whether it was with regard to floating or in any other respect.

MR. COLEFAX: Yes, undoubtedly. Mr Swinburne agrees with Prof. Cormack that so far as the means provided for obtaining floating are concerned, those in Bremer's specification are bad. What, then, is left? It is only the provision of a simultaneous downward feed to both carbons. When one looks at Bremer from that standpoint, has he devised a good means of obtaining that? The yoke arrangement with friction against the guides is bad, because it is an arrangement by which you stand a very fair chance of getting inequalities in the friction, with consequent inequalities in the fall

of the two carbons. So far as the "Excello" lamp was concerned, which had been put in by Mr. Marshall on plaintiffs' behalf, he did not think that, although it was claimed as being within Bremer's specification, Bremer would ever have recognised it. Furthermore, if Bremer had ever tried to make a lamp before he drafted his specification, what he would have made would have borne no similarity to the "Excello" lamp at all.

MR. JUSTICE SWINFEN EADY: Would it be correct to describe the "Excello" lamp as an improved Bremer?

MR. COLEFAX: It might be so described, but it was improved out of recognition.

Continuing, COUNSEL said that whatever merit the Excello lamp might have, it resided in the fineness of the mechanism, the scale on which it was made, and not on anything in the specification of Bremer.

MR. RUSSELL CLARKE, on behalf of the plaintiffs, replied at length, and at the conclusion of the arguments, his LORDSHIP reserved judgment.

THE NATIONAL TELEPHONE CO. *v.* THE POSTMASTER-GENERAL.

THE Railway and Canal Commissioners, Mr. Justice A. T. Lawrence, the Hon. Gathorne-Hardy and Sir James Woodhouse on Tuesday commenced the hearing of an application by the National Telephone Co. in respect of certain notices served upon them by the Postmaster-General in connection with the purchase by the Post Office of the National Telephone system.

Sir Alfred Cripps, K.C., Mr. Danckwerts, K.C., Mr. Forbes Lankester, K.C., Mr. Edward Morten, K.C., and Mr. H. A. Gaine were for the applicants, and the Attorney-General, the Solicitor-General and Mr. Brenem represented the respondents.

SIR ALFRED CRIPPS, in opening, said that when the National Telephone system was taken over it would be taken over on what were known as tramway terms; that was to say, it would not be taken over as regarded the main part of its business as a going concern on income, but taken over on the basis of the purchase of its lands, plant, buildings and equipment. The private business would be taken over on ordinary business terms, but the mass of the undertaking would be taken over on tramway principles. Of course, the tramway principles implied the taking of an inventory of the property to be taken over. At the present moment there were some 600 people engaged in taking this inventory; 400 employed by the National Telephone Co., and 200 on behalf of the Post Office. There was a power reserved to the Postmaster-General to give the National Telephone Co. notice that as regarded certain portions of land, plant, buildings and equipment, they were not to be included in the transaction. In other words, the excepted portions were not to come within the inventory of the property to be taken over by the Post Office. It was in respect of the notices served by the Postmaster-General upon the National Telephone Co. that the question now arose. The applicants' case was that these notices were bad, and clearly not notices contemplated by the terms of the agreement to purchase. The issued capital of the National Telephone Co. on December 31st, 1910—the business of the company was to be taken over as and from December 31st, 1911—was £11,483,593, and up to that date the actual sum expended was £16,154,566. To show the nature and size of the Telephone Co., the gross revenue for the 12 months ending December 31st, 1910, was £3,422,425, and the net revenue was £1,105,572. The company had paid in royalties no less a sum than £3,457,000, and during the year ending December 31st, 1910, there was paid £329,494, which was substantially 10 per cent. on the gross income. In regard to the licensed business of the company, they had a staff of 18,000, and if notice to purchase had not been given by the Post Office, the staff would have been 20,000. These figures would show the Court the enormous character of the transaction. As regarded the telephone itself, it was invented by Mr. Graham Bell in 1876, and it was made a practical working system by Edison's improvements made in 1877 and 1878. At that time the Post Office refused to buy the patent rights, on the ground, he believed, that they regarded it only as a toy. The patent rights were bought by the predecessors of the National Telephone Co., the United Telephone Co., in 1880. Towards the end of that year the decision was given in the well-known case of the Attorney-General *v.* Edison, and the effect of that decision was that the telephone was a telegraph, and that the ordinary public business of the company came within the Post Office monopoly under the Telegraph Acts. In 1881 the National Telephone Co. was formed, and practically almost without exception they carried on the telephonic business of the country for some years. The first formal agreement between the Postmaster-General and the National Telephone Co. was dated November, 1884, and it was an arrangement in regard to the licence given to the company to carry on their business. The next agreement was dated March 25th, 1896, and the effect of it was to transfer the trunk lines from the National Telephone Co. to the Post Office, the purchase price being £459,114. In addition to that, certain exchange areas were agreed between which the trunk lines were to run, and there was a provision to enable exchange areas to be arranged and agreed in the future.

COUNSEL proceeded to refer to other agreements between the Postmaster-General and the National Telephone Co., and said that in 1905 there came the purchase agreement. There was a clause in that agreement, part of which ran, "subject to the provision of this agreement all plant, land, buildings of the company brought into use with the sanction of the Postmaster-General, and in use by the company on December 31st, 1911, for the purposes of the licensed business of the company." These words were of extreme importance as showing what was to pass by the sale and purchase.

MR. JUSTICE LAWRENCE: Is the scheme that you are to be bought out altogether?

SIR A. CRIPPS: Yes, but there may be an arrangement by which we continue as agents of the Post Office for a certain business.

MR. JUSTICE LAWRENCE: The scheme is——?

SIR A. CRIPPS: That we are to go.

MR. JUSTICE LAWRENCE: They take over your business on certain terms as regards one branch of it, and on other terms as to the other branch.

SIR A. CRIPPS: Yes, that is so.

Proceeding, COUNSEL said that the case of the company was that, so far as they knew, all their plant which they were requiring the Post Office to take over came within the terms of the purchase agreement. It was all brought into use with the sanction of the Postmaster-General, and it was all in use by the company for the purposes of the licensed telephone business of the company. They were not aware, in fact, that there was any of their plant which was not perfectly suitable for use in connection with a telephone system. The agreement further provided that "The Postmaster-General may, by notice in writing given to the company not later than January 1st, 1911, object to buy such plant, land and buildings if he considers such will be unsuitable for the actual requirements of the telephone service of the Post Office on December 31st, 1911." Now the Postmaster-General had purported to give the company notice excepting from the agreement to purchase certain portions of the plant. The company objected to these notices as being wholly invalid. According to their view almost the whole of their plant, which had been made under the Postmaster-General's own specification, was suitable for the actual requirements of the telephone service of the Post Office on December 31st, 1911. That was one of the matters which the Court would be asked to decide. The company wrote and asked the Postmaster-General what he meant by suggesting or saying that any part of their plant was not suitable for the requirements of the Post Office. The reply was an astonishing one, and he ventured to think entirely out of accord with the whole agreement. The Postmaster-General said "Suppose on December 31st, 1911, in any one of the competitive areas we have constructed sufficient plant for the purposes of the services there being carried on, then we claim to say that your plant is unsuitable." That was the claim they had made. It was an astounding and impossible claim. They did not say that in kind, character or nature, that the plant was not suitable for the purposes for which it was designed, but they said if in one of the competitive areas they had sufficient plant to meet the requirements of the moment, they claimed that the plant of the Telephone Co. there should be scrapped and not one penny would be paid for it. How such a claim could be made it was difficult to understand. Of course, in the old tramway cases the purchaser was not bound to take over plant which in its nature or character was unsuitable for the purposes for which it was to be used, but here the whole plant was admittedly suitable in the ordinary sense, but it was actually constructed in accordance with the requirements and specifications of the Postmaster-General himself. What did the contention of the Postmaster-General amount to? It meant that the Post Office had only to spend sufficient public money between now and the date of the transfer to render the whole of the company's plant in the competitive areas liable to be scrapped on the ground that it was not required for the actual requirements of the telephone service of the Post Office. The plant of the Telephone Co. would have nothing but scrap value, which was practically nil, and would hardly cover the cost of removal.

THE ATTORNEY-GENERAL: Whatever view may be taken of it, it only applies to the competitive exchange areas, and to these areas only. I don't agree with my friend's view of what our contention is. I will deal with that at a proper time.

SIR A. CRIPPS said it was true he was dealing with the competitive exchange areas. It could only apply to cases where the Post Office had plant as well as the National Telephone Co. But if the contention of the Postmaster-General was sustained, the effect would be that plant costing hundreds of thousands of pounds would come down to nothing. The company had written to the Postmaster-General complaining that the notices served upon them were insufficient, and asking to be supplied with lists of the plant which it was not desired to take over. The answer was that it was impossible for the Postmaster-General to make a complete list of the various items, that the notices fulfilled the requirements of the purchase agreement, and then there was the passage:—"The Postmaster-General has no objection to stating, for the information of the company, that the plant which he objects to purchase in the competitive areas, otherwise than on account of its objectionable character, he considers to be unsuitable for the requirements of the telephone service on December 31st, 1911, because he will on that date be in possession of other sufficient plant suitable for the requirements of his service in the several areas in question. Whilst making this statement the Postmaster-General reserves to himself the right to state other grounds of objections." The absurdity of the position was shown by the fact that in respect of the London area there would be comparatively little for the Postmaster-General to take over.

The ATTORNEY-GENERAL pointed out that unsuitability as to the character of the plant was an entirely different question from unsuitability looked at from the point of view of duplication or surplusage.

SIR A. CRIPPS: Is my learned friend going to say that all the lines and cables connecting exchanges are unsuitable in the sense of not being suitable for the work?

The ATTORNEY-GENERAL: Unsuitable for our requirements, yes.

SIR A. CRIPPS: Do you mean because you have got alternative plant?

The Attorney-General: I said unsuitable for the actual requirements of the business within the words of the clause in the agreement. There is a point between us upon what I call convenience. The question whether the plant is required for our use is one point. Then there is another point whether the plant is suitable in character. To put it in a word, the whole of these exchanges are worked on what is called the magneto system. We say that is an obsolete system as compared with the automatic system. That, from one point of view, is fatal, and we cannot conveniently adopt it. It is quite impossible for us to take over the magneto system. Then there is another objection, and that is that the wires are overhead, and not underground.

Sir A. Cripps did not think it could be contended that the telegraphic lines would be any different whether under the magneto or the automatic system. How could it be said that "all telegraphic lines connecting the exchanges" were unsuitable?

The hearing was adjourned.

Arbitration.

A contract relative to the construction of a power station at Bryncoch formed the subject of arbitration proceedings at the Cardiff Law Courts on May 2nd, before Mr. E. J. Pollock, K.C., sitting as Official Referee. It was a case in which William Thomas and Co., contractors, Cardiff, claimed £1,448, being £848 balance of account due, and £600 for damages from the Main Colliery Co., Ltd., Neath Abbey. The defendants made a counterclaim for £4,623 odd. It appeared that in May, 1908, a contract for the construction of the power station at a cost £4,193 was entered into, and plaintiffs proceeded with the work until there was some complaint with regard to the concrete work in the engine beds. They alleged that they were stopped by the company, and now claimed the £848 due for work done and £600 damages for refusing to be permitted to resume the work. The proceedings were adjourned.

REVIEWS.

Traité de Physique. By O. D. Chwolson, translated by E. Davaux. Paris: A. Hermann et Fils. 1910. Price 11 fr.

The bulky paper-covered volume before us is the second portion of the third volume of a treatise on Physics, by Prof. Chwolson of the St. Petersburg University. The treatise appears to be a most comprehensive work, Vols. I and II having apparently considerably over 1,000 pages each, while this portion of Vol. III begins at page 408, and finishes at pages 744, and is to be followed by a third section.

A cursory glance is sufficient to show that thoroughness is the keynote of the book. Four Chapters, VIII to XI inclusive, are contained in this section, and deal with thermodynamics, fusion and vaporisation, &c. At the end of each chapter there are several pages of bibliography which must be of inestimable value to anyone desirous of making an independent study of the various points involved. The volume is well furnished with diagrams and blocks of apparatus, &c., and those illustrative of the apparatus used by some of the earlier experimenters are of special interest.

Chapter VIII "The Principles of Thermodynamics" opens with a short introduction in which the author states that "thermodynamics, in the general sense of the word, is the science of energy and its properties," and "rests upon two fundamental principles," which "are physical axioms, established empirically." After mentioning the names of various workers to whose labours these thermodynamical axioms are due, the author goes on to enunciate the first principle, and describes the work done by experimenters in this field. The mechanical equivalent of heat next takes up attention, and here the methods used by various workers in attacking the problem are described, and the results obtained are given. We have the apparatus used and the results obtained by Joule, Rowland, Puluj; the "shock" method by Hirn; method of electromagnetic induction; the heating of a conductor by an electric current, &c.

This is followed by an investigation of "expressions of the form $X_{dx} + Y_{dy}$"; the "dimensions determining the state of a substance"; "the ideas of reversibility and irreversibility"; "the graphical representation of cycles"; "the heat received by a body" and "formulæ based on the first principle."

Section X of this chapter deals with the Carnot cycle, for which the formulæ are worked out in detail. In passing, particular notice must be made of the parenthetical biographies, or biographical parenthesis which enrich the volume. Here we have (page 472): "Among the reversible cycles, the Carnot cycle (Sadi Carnot, fils du Grand Carnot de la Revolution et oncle de l'ancien President de la Republique, enlevé en quelques Leures, par une attaque choléra, le 24 aout 1832, á 36 ans) possesses a special theoretical and historical importance." The portion in parenthesis (left untranslated by the reviewer) is a sample of the concise biographies referred to, and which appear in several places throughout the volume. Then the "Le Chatelier-Braun," or second principle of thermodynamics, is treated, and the work of Carnot and Clausius, Thomson (Lord Kelvin) and Boltzmann reviewed in detail. Then in succession the author deals with formulæ based on the second principle, the internal energy of bodies (Kirchhoff's formula), entropy and its properties, &c., and the "Mechanical Interpretation of the Second Principle" is the concluding section of the chapter.

Chapter IX is devoted to the application of thermodynamics to phenomena studied in the previous volumes of this treatise—such as that of a perfect gas, gas thermometers, surface tension, calorific capacity, dissociation and diffusion of gases, and pressure due to radiant energy.

The following chapter deals with an important phase of the subject—namely, the passage of a body from the solid to the liquid state, and *vice-versâ*, as also the application of thermo-dynamics to the general case of the passage of a body from one state to another. After some general remarks, in which the idea of latent heat is introduced, the author goes on to consider the "Fusing Point of Solid Bodies" and "of Alloys and Mixtures," and the "Variation of Volume in Fusion." Then the formulæ are worked out for the general case, and the "Influence of Pressure on the Fusing Point," the "Latent Heat of Fusion" and "Allotropic Changes" are successively treated, several examples of fusion curves being given. The bibliography appended to this chapter extends to six pages and ranges from Fahrenheit, 1724, to Goodwin and Kalmus, 1909.

The concluding chapter of the volume deals with an equally important subject, "The Passage of a Liquid or Solid to the Gaseous State, or *Vice-versa*."

This subject is divided into eight sections: Vaporisation and Liquefaction, Ebullition—in which Moissan's classic experiments with the electric furnace are illustrated and described—and the Spheroidal State. Referring to the latter, the author says: "Different experiences and certain phenomena are explainable by the spheroidal state. This state is one of the probable causes of explosions in boilers. One might mention here the well-known fact that it is possible without danger to plunge the hand, slightly damp or moistened with ether, into melted lead or even into melted brass or bronze." The fourth section of the chapter treats of the "Latent Heat of Vaporisation," and the work of Renault and Berthelot, Dewar and Mills, and many others is surveyed. After applying the principles of thermodynamics to vaporisation, the liquefaction of gas is taken up. Starting with Van Marum, A.D. 1799, who is credited with being the first to liquefy gas (NH_3) at about six atmospheres, the author traces all the work done on this particular line up to Claude's 1910 results.

This section is well illustrated, diagrams and general arrangement illustrations being given of many different types of apparatus, including that used by Kammerlingh Onnes in the liquefaction of helium at 4·5° absolute. A table is also included giving critical temperatures and pressures, boiling and melting points for various gases and liquids.

Volatilisation of solids and dissociation conclude this interesting chapter.

Taken as a whole, the volume seems very free from serious error, is conscisely written without any unnecessary matter, and is one well worthy of perusal.—J. D. M.

Meter Approved.—The Board of Trade has approved Hookham's patent C.C. meter, combined with Lackie's patent demand indicator, deposited by Messrs. Chamberlain & Hookham, Ltd.

BUSINESS NOTES.

Catalogues and Lists.—MESSRS. A. HIRST & SON, LTD., Dewsbury.—Catalogue containing a very full account of their Crescent electric coal-cutting and drilling machinery. Excellent half-tone illustrations are given of skid and low types of disk coal-cutters with D.C. and A.C. motors, also the Crescent chain coal-cutter, undercut and overcut types. A list of users is given. Some of these machines are on view at the Manchester Colliery Exhibition.

THE BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD.—A very useful brochure (No. 7,711/1) has been issued, wherein there are given reprints of the report of the Departmental Committee on Electricity in Mines, and the appendix and memorandum that were issued therewith a few months ago. Sandwiched between these is an 18-page supplement containing fully illustrated particulars of Westinghouse ironclad mining switchgear, typical mining switchboards, oil-break main switches, air-break mining switchgear, cellular ironclad switchboard, and Westinghouse Merz-Price apparatus. Copies of this publication can be obtained by sending a business card to the company.

THE BRITISH NICLAUSSE BOILER CO., LTD., Caxton House, Tothill Street, S.W.—Sixteen-page pamphlet (No. 2) containing descriptive matter relating to the Niclausse automatic mechanical stoker, accompanied by a number of half-tone views showing the stoker and its constructional details.

MESSRS. ATKINSON BROS., Aire Place, Kirkstall Road, Leeds.—Three lists describing, illustrating, and stating prices of the following manufactures:—Electrically-driven sensitive drills, motor-driven hack saws, factory and workshop punkah fans and box-blade electric fans.

THE TRACTION SUPPLIES CO., LTD., Gill Bridge Avenue, Sunderland.—12-page catalogue illustrating White's patent controller fingers with reversible and renewable contacts, including some new patterns. Fingers for B.T.-H. and G.E.C. (America) patterns, Dick Kerr, Westinghouse and Stellite patterns are all shown. Prices are quoted in the list.

THE GENERAL ELECTRIC CO., LTD., 67, Queen Victoria Street, London, E.C.—Leaflet No. X 1,470, containing a description of their "Twinbreak" ironclad switch, 20 amperes, 500 volts.

THE M. AND C. MANUFACTURING CO., Conduit Place, Paddington, London, W.—New list containing particulars and prices of their resistances specially made for kinematograph arcs and other purposes requiring continuous rating resistances.

MESSRS. SIEMENS BROS. & CO., LTD., Caxton House, Westminster, S.W.—Reprint (No. 531 A) relating to "Leclanché Cells and Batteries." The list forms a condensed arrangement of the Leclanché cell section of the firm's main catalogue of Fluid Batteries, No. 531, and has been issued for supplying to contractors, ironmongers, &c., who are interested in Leclanché cells, but who do not require particulars of Daniell or other fluid cells, which are less often called for. Copies will be forwarded to anyone interested.

Book Notices.—*Report* of the Departmental Committee on the Science Museum and Geological Museum. London: Wyman and Sons. Price 3d.—This report, drawn up by a Committee of distinguished scientists and engineers, while it commends many features of the Science Museum at South Kensington, emphasises the urgent necessity of greater space in which to display the valuable exhibits already shown, and to house additional collections of apparatus, &c. Electrical engineering, it is stated, has found no adequate allocation of space in the Museum, and the section requires to be increased to five or six times its present dimensions; in no section is there more need of early action to secure for the Museum examples of instruments and appliances that have marked the opening of a new era in invention and industry. The needs of this department are fully detailed in an appendix, and in view of the importance of the subject, a floor space of 21,000 sq. ft. is mentioned as being necessary.

The Motor Cyclists' Handbook:—A Practical Manual of the Construction and Management of Motor-Cycles. By Chas. S. Lake, A.M.I.Mech.E. London: Percival Marshall & Co. Price 1s. 6d. net.—No one who has occasion to get about the country can fail to have been struck with the great increase in the number of motor cycles now on the road, the development of these machines having brought the new pastime of motoring within the reach of thousands who cannot afford the more costly means of travel—the four-wheel automobile. Both classes of self-moving vehicle—the car and the cycle—are nowadays much more reliable than those of a year back, with the result that one rarely meets a machine *en panne* on the road. At the same time, the motorist or the motor cyclist—and particularly the latter, who is at once his own driver and mechanic—must be prepared for any emergency, and hence must make himself *au fait* with his machine, so that he may diagnose any cause of irregular running or stoppage of his engine, and remedy the same with a minimum of delay. Hence it is that we witness the appearance of handbooks intended to educate users of motor-cycles in the way above mentioned. The one just issued from the pen of Mr. Lake can be well recommended as covering the ground most thoroughly. In a series of 14 well-illustrated and lucidly-written chapters, the author deals with all the vital parts of the motor-cycle. Naturally, we turn to that devoted to the question of "ignition," where the novice will find the magneto described in simple language, the section also dealing with alternative forms of ignition—by primary and secondary batteries in conjunction with induction coils—as well as components of the ignition system common to all the methods of obtaining the necessary spark. Published at a popular price, and provided as it is with a very full index, the book is one which should have a large sale.

"*Journal* of the Institution of Electrical Engineers." Vol. 46. No. 206. London: E. & F. N. Spon. Price 5s. The issue for April, 1911, contains the following papers:—"The Magnetic Properties of Iron and its Alloys in Intense Fields," by Sir Robert Hadfield and Prof. B. Hopkinson; "Submarine Cables for Long-Distance Telephones," by Major W. A. J. O'Meara; "Control of Electric Winding and Hoisting Engines," by Dr. E. Rosenberg; "Static Sub-Station Design," by P. V. Hunter; "A Graphical Treatment of the Skin Effect," by Prof. Alfred Hay; and the Proceedings at the Annual Dinner, 1911.

"The Engineering Index Annual for 1910." London: The *Engineering Magazine*. 1911. Price 10s.

"Science Abstracts." Sections A and B. Vol. XIV, Part 4. April 25th, 1911. London: E. & F. N. Spon, Ltd. Price 1s. 6d. net each.

"Boletin de Ingenieros." Vol. I, No. 8. April, 1911. Mexico: Secretaria de Guerra.

"*Proceedings* of the Engineers' Club of Philadelphia." Vol. XXVIII, No. 2. April, 1911. Philadelphia: The Club.

"The School of Mines Quarterly." Vol. XXXII, No. 3. April, 1911. New York: Columbia University. Price 50 cents.

"The Physical Review." Vol. XXXII, No. 4. April, 1911. Lancaster, Pa.: The *Review* Office.

Trade Announcements.—THE ELECTRICAL APPARATUS CO., LTD., owing to continued increase of business, have removed from Battersea to larger works and offices which they have erected at Vauxhall. Their address is now:—Vauxhall Works, South Lambeth Road, London. These new works have a capacity of from six to seven times the accommodation of the Battersea works, and the change has been necessitated by a very large increase in output of E.A.C. meters and motor control gear. The firm's telephone number is Brixton 1975.

MESSRS. WILLIAM SANDERS & CO., switchboard and switch manufacturers, Falcon Electrical Works, Wednesbury, have terminated their agency with Messrs. O'Reilly, Holt & Fielden, and have appointed in their stead, Mr. H. V. Sadler, as their sole London and District representative. He will have charge of their new office at 90, Charing Cross Road, W.C. (second floor), and stocks of the firm's manufactures will be kept.

The offices of the WELSBACH LIGHT CO. OF AUSTRALASIA, LTD., have been removed to 55-59, Great Saffron Hill, Holborn, E.C. Telephone number, 6,300 Holborn.

MESSRS. MARRYAT & PLACE have appointed Messrs. Leslie and Co., of 888, Hay Street, Perth, Western Australia, as sole agents for their lifts in Western Australia, and Messrs. Mervyn W. Stevenson & Co., of 188, Hereford Street, Christchurch, New Zealand, as sole agents for these lifts in New Zealand.

THE WALSALL ELECTRICAL CO., LTD., of 59, Bridge Street, Walsall, have, owing to increased business, doubled the area space of their meter workshops, having sold more meters during the first four months of this year than in any previous 12 months. An expensive plant and a new test room which have just been put down are open to inspection by customers and others at any time. The firm's standard meters can be delivered with any reading at from three to four hours' notice.

Dissolutions and Liquidations.—THE SYLVERLYTE ELECTRIC LAMP CO., LTD.—A meeting is to be held at 46, Culverden Road, Balham, on May 27th, to hear an account of the winding up from the liquidator, Mr. A. Riding.

MESSRS. PINCHING & WALTON, electrical engineers, 52, Cannon Street, E.C.—Messrs. E. L. Pinching and W. H. Walton have dissolved partnership. Mr. Walton will continue the business under the old style.

BRITISH RADIO-TELEGRAPH AND TELEPHONE CO., LTD.—A meeting is to be held on Tuesday, June 6th, at 5, London Wall Buildings, E.C., to hear an account of the winding up from the liquidator, Mr. G. P. Grenfell.

COWANS, LTD.—A meeting of creditors is called for May 17th at 60, Spring Gardens, Manchester, to hear a statement of affairs.

NORTH-WESTERN ELECTRICITY AND POWER GAS SYNDICATE, LTD.—A meeting of creditors is to be held at 37, Cross Street, Manchester, on May 12th. Mr. C. E. Bullock, 17, Albion Street, Hanley, liquidator.

Colliery Equipment.—At the Manchester Colliery Exhibition, which opens to-day, MESSRS. W. H. BAILEY & CO., LTD., of Salford, exhibit pumping machinery, air compressors, and a large variety of steam and water fittings. The exhibit includes a horizontal three-throw ram pumping engine, which has a capacity of 5,400 gallons of water per hour against a head of 300 ft. It is provided with an extended bedplate to receive an electric motor for driving the pump through gearing, or it can be belt-driven by fixing a pulley on the countershaft. All parts are proportioned for heavy continuous work. Each barrel is a separate

casting bolted to the bedplate. The rams are fitted with cross-heads which work in slipper guides, so as to take all stress from the stuffing boxes. The valves and seats are of gun-metal, and each valve and seat is fitted in a separate valve box, so that the pump need not be stopped in the case of failure of one valve. The valve boxes are connected to branch pipes, so that the suction or delivery pipes may be fixed on either side of the pump. Eight pumps of this particular size have been delivered to one colliery in South Wales. A "Davidson" pump is shown working. It is supplied with compressed air from one of Bailey's "Köster's" patent electrically-driven two stage air compressors. The "Köster's" patent machine can be run at high speed, and can be either coupled direct to electric motor or driven by a motor through one train of gearing. We understand that Messrs. Bailey have recently delivered a number of these compressors for working in coal mines for driving coal-cutters, pneumatic drills, &c. Other exhibits shown by the firm include their "Aqua-Thruster" specially designed for coal-washing; recording instruments for autographically recording steam pressure, speed in revolutions per minute, the number of revolutions made by fan engine, and fan pressure up to 6 in. of water, and many other specialities, such as Foster's patent reducing valve, patent "Key-Ring" stop valves with renewable seats, patent "Silver Star" force feed pump lubricators, injectors and ejectors, a large variety of pressure and other gauges, &c.

For Sale.—Tenders are being invited for the purchase of the land, manufactory, and the equipment of the latter, also the patent rights, contracts, goodwill, &c., of the British Tungsten Lamp Co., Ltd., at Huyton Quarry, near Liverpool. Some particulars are given in an advertisement to-day.

American Electrical Industry. — "The financial journals announce that among the electrical manufacturing companies the sales for both January and February have been lighter than last year. The volume of orders in all of the companies is larger, but the average size of individual orders is very much smaller. In other words, there has been a fairly good business in small apparatus and very little done in large apparatus. It is stated that the Westinghouse Electric and Manufacturing Co. and the General Electric Co. are now working at about 73 per cent. of normal output. The General Electric Co.'s report for February showed some increase, and indicated that the average monthly ratio would mean a yearly basis of $58,000,000. This is regarded as a distinct improvement in February, because the January orders were at the rate of only about $48,000,000 per year. The average for the two months was at the rate of about $53,000,000 per year, which compares with about $60,000,000 for the same period a year ago."—American *Electrical Record*.

The same contemporary states, on another page:—"Unlike other electric companies which are reporting smaller gross business than a year ago, the gross of the Western Electric Co. for February was not only 20 per cent. larger than the corresponding month in 1910, but constituted a record for February business. In January the making up of returns for last year may have thrown some of the business into February which otherwise would have come into the January sales returns, but that will not account for the entire increase. On the basis of two months for which reports have been received, gross sales for the year should be about $71,000,000. This would set a new high record in the Western Electric's business, exceeding by $2,000,000 that of 1906."

Bankruptcy Proceedings.—EMIL LAURENCE OPPERMAN, electrical engineer, 12, Trevor Square, Knightsbridge.—Under a receiving order made in the London Bankruptcy Court, the first meeting of creditors was held last Tuesday before Mr. G. W. Chapman, Official Receiver. The debtor acted as managing director of the "X" Electric Accumulator Co., Ltd., which was formed in 1905 to take over and work an invention of his relating to storage batteries. The company had an existence of three years, but no dividend was paid, and when it went into liquidation in 1908, the "X" Syndicate, Ltd., was formed for the purpose of taking over the assets. The syndicate carried on business for about 12 months, and then went into liquidation. The debtor also acted as managing director of the syndicate. Prior to 1905 he assisted another syndicate, which was formed for the purpose of working and developing a storage battery. During the last 18 months, the debtor has been engaged in the promotion of a company to take over some rubber concessions in Sumatra. The company has not yet gone to allotment, owing to difficulty experienced in getting the shares underwritten and obtaining the necessary money. The debtor returns liabilities £2,700 and no available assets. He attributes his failure to the collapse of the negotiations for the flotation of the rubber company. In the absence of any offer, the case was left in the hands of the Official Receiver, to be wound up in the ordinary course of bankruptcy.

A. C. A. WAMPACH, electrical engineer, Hythe.—First meeting, May 17th; public examination, May 20th; both at Canterbury.

Electrical Exhibition at Hornsey.—On Monday last there was opened at the Athenæum, Muswell Hill, N., an Electrical and Domestic Exhibition organised by the Hornsey Borough Council Electricity Department. The collection of exhibits that has been brought together will doubtless attract and interest some thousands of ratepayers and others this week, and from our impression—formed as we overheard the confident and forceful testimony of stand attendants as to the efficacy of electrical appliances in comparison with "some others"—we have little doubt that many an additional light, heat and cooking consumer will soon be on the mains. The Dowsing Co., with its luminous electric radiators and Solarium sun baths, has done much to instruct the public already at previous exhibitions, and it continues to do so by an effective display arranged in one corner of the Hall, where one of its latest lines, an electric hair dryer, should please the ladies as well as those who want to please them. At the opposite corner, the Western Electric Co., Ltd., has a fine show of telephone instruments, and sandwiched between these two exhibits stands the "Therol" water heater, which it can only do the public good to get to know all about. Leaflets never can show effectively how electrical illumination devices will display themselves at Coronation time, but here at Hornsey, in all their gaiety and bright colour, there is a capital showing of the Fairyland strip system, a number of electric advertising signs, and some fine letters and stars which, if they behave on the nights of June 22nd and 23rd as they did last Monday, should please the throngs of London. A number of local contracting firms—Messrs. Carpenter, H. Gorton & Co., Harry Walker, Southey & Co.—have each some of everything electrical, and they have co-operated in an enterprising way to make the Exhibition what it ought to be. Southeys will catch the eye of many with the big announcement that a "six-roomed house can be fitted up from £5." The Electric and Ordnance Accessories Co. is showing its latest type of "Eclipse" electric cooker, and the presence of the lady "operator" and the "nicely done" eatables will, as always, draw. The Brush Co. are in strong force with a good collection of high and low candle-power "Metallum" lamps, electric fans, &c. The Hobart Electric Manufacturing Co. shows the Hobart direct-driven electric meat chopper, which we understand had sold in its thousands before the company came across the Atlantic last year to push it here. The company supplies these choppers with motors of from ¼ H.P. to 10 or 20 H.P., and it is now opening out in London, having just succeeded in winning its way well in Glasgow. The Daisy vacuum cleaner is shown by Mr. J. A. Ritchie, and the Electricity Supply department, of course, has its first aid stand for the purpose of attending to inquiries, and sealing contracts. There is one exhibit which we came upon quite by accident, but we are glad we found it. It was in a sort of "side-show," and was arranged by the Berry Construction Co., Ltd. It consisted of a counter full of apparatus, a dozen or so chairs, a lady cook, and a gentleman lecturer. As we arrived upon the scene, the said lecturer was engaged getting home to the minds of some stubborn voteless ones who were wedded to gas and the coal fire, the, to us, household truths concerning the advantages of electric cooking. It was all very entertaining, and our chief entertainment was when that mere man got the last word! "Well, madam, you could not do *that* with a kettle warmed on a gas or coal stove," as the kettle was placed upon the white table-cloth without soiling it. We said that the lecturer had the last word—that was a mistake—for the lady, without a trace of reluctance, said: "Well, no—you're right there." The "Tricity" cooker, and that winsome, convincing, persuasive demonstrator, form an ideal combination. At all events, that is the impression that they left upon our mind.

Pocket Battery and Lamp Manufacture in England.—It is estimated that the very large importation of batteries for pocket lamps and electric torches from Germany has amounted to somewhere between 1½ to 2 million batteries yearly for the last three or four years; it is also stated that the number of pocket lamps and electric torch cases annually imported from the same country is upwards of 500,000. The Efandem Co. have been experimenting for the last three years to make a battery in this country if possible superior to the imported batteries, and we understand that they are now making these flash-lamp batteries in all sizes at their own works entirely with British labour, and at competitive prices and of competing quality. The same thing applies in respect of pocket-lamp cases. The company are making everything from the cheapest to the most expensive *de luxe* quality. In regard to the pocket-lamp cases, the company have adhered, to a great extent, to the standard at present on the market. The Efandem Co. are moving in June into new works, which they are building at present, and they will there have ample capacity for filling British requirements.

Silvertown Rubber Works Athletic Club.—The first annual sports meeting was held on Saturday last at the Memorial Grounds, Canning Town. Glorious weather prevailed, and the event was most successful, while the attendance was the largest seen at these Grounds for some time. The event of the afternoon was the "Marathon" race of 10½ miles for the "Gray" Challenge Cup and Gold Medal. This was the third year of this race. On the first occasion it was run on the road, last year at the Memorial Grounds, and this year it was included in the programme of the Athletic Club's first sports meeting. As a result of Saturday's race the Cup still remains in the possession of G. Peters, a fine natural runner, he having been the winner on each of the three occasions of the race. The prizes for the second and third men home were a marble clock and a kit bag respectively, and medals were offered to competitors who finished the course in 70 minutes and under. Only the first four, however, were able to claim these medals. There were 11 starters, six finishing, and the race, as in previous years, proved an easy thing for Peters, who ran strongly throughout. His time was 64 min. 59 sec. The 100 yards' sprint was won by A. Baker in 11 sec., and the 440 yards' race by the same runner, in 58⅘ sec.; E. Cole won the 3 miles in 17 min. 50⅘ sec.; T. Tyrie was successful in the 1 mile, in 5 min. 22⅘ sec.; T. Willis won the 1 mile cycle race in splendid style by half-a-wheel, in

2 min. 45⅘ sec. The tug-of-war produced the greatest rivalry between the various shops competing, and was won by "N" Department; "F N" team won the 1 mile relay; B. Knight the 100 yards' race (under 18); D. Young the 300 yards' handicap race for boys under 14 years, sons of employés; Miss N. McAlenon the 50 yards' skipping race, and Miss L. Kerry the 50 yards' thread-the-needle race. At the close of the events, Mrs. P. M. S. Brodie, wife of the president, presented the prizes to the successful competitors. During the afternoon a programme of music was rendered by the Graysilver Military Band, under the conductorship of Mr. J. H. Parnum. This band was formed about a year ago.

LIGHTING and POWER NOTES.

Aberdeen.—The Scottish office has suggested several changes in the provisional order applied for by the Corporation. Among them is the proposal that separate accounts should be kept for the refuse destructor and the adjoining generating station if one is erected. The Scottish office further suggests a clause providing that the cost of the electricity generated by the refuse destructor should not be less than the cost of production at the electricity station at Ferryhill. The Bills and Law Committee are to oppose the introduction of such a clause, as they consider it a far reaching one, especially as the Corporation had not decided definitely as to the utilisation of the power generated by the refuse destructor.

Australia.—Correspondence has passed between the Adelaide City Council and the Adelaide Electrical Supply Co., in regard to the purchase of the company's undertaking. The company has declined to accept a statutory notice to arbitrate so that the value may be determined by December 11th, 1911, after which date the local authority has power to purchase.

Bampton.—The U.D.C. on May 3rd passed a recommendation in favour of public lighting by electricity, and the working of a similar scheme at Bradninch is to be inspected by a Committee. A company, to be formed, has offered to light the town on a seven years' agreement for £49 per annum, whereas the yearly cost of oil lamps is £55.

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We are informed by Mr. Dykes, consulting engineer to the company, that the fire originated in the roof of the old portion of the station, which formerly contained steam plant, but was practically empty at the time; it is believed that it arose from a short-circuit amongst a number of ignition cells which had been on charge in that part of the building. The plant is shut down at night, supply being maintained by a storage battery, and when the resident engineer, who lives on the premises, arrived in the engine room, he found the battery and switchgear in perfect order, and current

going out as usual. He at once opened all the switches and sent for the fire brigade, but in spite of every effort it was impossible to prevent the roof and the engineer's residence from being burnt out: the engineer's family had to escape from his house precipitately. The work of removing the mass of *debris* which had fallen on the generating plant and switchgear was at once commenced. The D.C. and A.C. generators and auxiliary machines were found to be badly damaged with fire and water, and the governor gear of one of the Diesel engines was smashed, while the switchboard, which was erected by the E.C.C. only a year ago, was ruined, and the battery also was wrecked. Mr. Dykes was early on the spot, and promptly made arrangements to resume supply; a balancer and switchgear were borrowed from the Leatherhead E.S. Co., who willingly lent their aid, as also did the Guildford Co., and the damaged parts of the generators were at once dispatched to the makers. The E.C.C. immediately forwarded new coils for the alternator armature, and the field magnets, which were soaked with water, were dried out; the Mirrlees Bickerton Co. dispatched new governor gear, and temporary arrangements were made which enabled the company to resume the D.C. supply on Friday and the A.C. supply (to Haslemere) on Sunday—a very quick restoration of service.

Japan.—Judging from the last issue to hand of the *Japan Mail*, quite a boom is setting in in Japan in the way of the formation of new electric lighting companies. In Osaka alone, there are reported to be no less than 10 companies seeking charters.

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Rotherham.—The annual report of the electrical engineer states that the average price per unit received during the 12 months was 1·53d., as against 1·76d. in the previous year. The net profit, however, for the 12 months under review was £3,740, representing 6·43 per cent. on the capital expenditure, and was much more favourable than for the preceding year, when the surplus was £2,922, or 5·68 per cent. on the capital expenditure. The units sold for tramway purposes increased over the previous year by 10 per cent. The actual increase in units sold for lighting purposes was 5,710, representing increased receipts of £95. The reason for the small increase was the almost universal adoption of the metallic-filament lamp. The period for the necessity of running the small station at Wincobank was now drawing to a close, and this would be an advantage to the undertaking. The expenditure in distribution had increased from £797 to £1,197, but no less than £501 of the total was accounted for by the allocation of the cost of new services and meters to revenue.

Sandwich, Deal and Walmer.—The prov. order for E.L. applied for by the Electricity Supply Co., Ltd., has been granted by the B. of T.

Sevenoaks.—The B. of T. has granted the U.D.C. a prov. order for E.L.

South Africa.—A Bill is being introduced in the Natal Provincial Council, by the Natal Muncipal Association, to amend in certain respects an existing law and to provide for the supply by municipalities or local boards possessing power stations, of electric current outside their respective boundaries. This will principally affect Durban and Pietermaritzburg, where there are many industries just outside the respective boroughs.

Our readers will probably be aware of the time signal which is issued by the Durban municipality by momentarily lowering the electric light supplied from their power station at 8 o'clock each evening, the signal of the hour being given from the Observatory. This has so impressed the visitors from Johannesburg that that municipality has also followed on the same lines of indicating standard time all over that town.

The electric light plant at the Ladysmith works being taxed to its utmost capacity, it has been decided to increase the plant by the following:—One 240-H.P. engine, estimated cost, £900; two 75-KW. dynamos, estimated cost, £500; and instruments, £35.

The De Beers Co. has agreed to reduce its prices of electric current to the Kimberley Council, from 5½d. to 2½d. per unit, on condition that the Council in its turn agrees to reduce the charge to private consumers to 6d. per unit.

Street lighting in Durban has taken a change for the better, and many improvements and extensions are to be taken in hand at once. The chief improvement is the substitution for the old enclosed arc lamps of 400 C.P. metallic lamps, and the adding of new lamps where the present lighting is insufficient. The present system of arc lighting by five in series does not lend itself to extensions so well as with the 400 C.P. lamp, which will burn off the A.C. mains, and the number of which on any one circuit is not restricted. It is estimated by this substitution to effect a saving of £400 per year. In the principal street in the town, however, it is suggested to change the enclosed arcs to flame arcs. For the suburban lighting the present 10-C.P. carbon lamps are being replaced by 32-C.P. "Osram" metallic lamps, while side-street lighting is also to be largely extended. The Durban Corporation intends to be well to the fore at the Agricultural Show to be held here in July next, as it is proposed to equip a model kitchen with heating and cooking apparatus, at which practical demonstrations will be given.

Stalybridge.—The Stalybridge, Hyde, Dukinfield and Mossley Joint Tramways and Electricity Board proposes to install another 2,500-KW. turbine plant at the generating station.

Swindon.—The T.C. has decided to apply to the L.G.B. for a loan of £3,510 for electricity purposes.

Thames Valley.—At the meeting of the Metropolitan Water Board on Friday, the Works and Stores Committee reported that proposals had been placed before it by the deputy chief engineer for an extension of the electric lighting system at the Hampton station and the electric lighting of the Surbiton station. At the Hampton station the total cost of the work, including the provision of the necessary plant, wiring, lamps, &c., would amount to approximately £1,400, and the upkeep of the new plant, together with the interest upon the capital outlay, would amount to approximately £260 per annum. As the cost of lighting this portion of the station by gas at the present time amounts to over £400 per annum, it will be seen that a considerable saving can be affected. The whole of the Surbiton station is at present lighted by gas, and it is proposed to install a dynamo and switchboard at a total cost, including lights, plugs, wall switches, the necessary foundations, steam pipe, &c., amounting to about £1,675. The average annual cost of the existing gas lighting amounts to £680, and the cost of maintenance of the proposed electric plant, together with interest on the outlay, would amount to about £320. The Committee stated that it concurred in the engineer's recommendations, and proposed that the work should be carried out by the board's workmen. This is to be done.

U.S.A.—Mississippi River hydro-electric energy for St. Louis, from the great dam being constructed across the river at Keokuk, Ia., is now positively promised for delivery in 1913. Financial arrangements for the first 120,000-H.P. portion of the undertaking are reported to be completed, and a large force of engineers, draughtsmen and labourers is now at work on the site. The plan involves ultimate developments of 200,000 H.P. and 300,000 H.P., with a 110,000-volt transmission line into St. Louis, 140 miles distant, and a power network furnishing hydro-electric energy to towns surrounding the development.

In connection with the proposed addition of about 10,000 street arc lamps to the 12,000 already in use in Chicago, the *Electrical World* says that a series A.C. 60-cycle flame-arc type of lamp is proposed, to burn on 60 volts at 10 amperes. The lamp will be enclosed, and the minimum burning hours will be 100. These lamps are classed by our contemporary as being between the ordinary flame arc and the old enclosed carbon arc lamp, and are stated to be probably the most powerful illuminant used for regular street lighting on a large scale in the United States.

Wadebridge.—The U.D.C. has accepted the tender of the E.L. Co. for public lighting on the Egloshayle side of the town.

Warmley.—The B. of T. has given notice that it has revoked the Warmley Electric Lighting Order, 1903, as from April 24th, 1911.

West Ham.—At the meeting of the Corporation on Tuesday, the Electric Lighting Committee reported having received an important communication from the electrical engineer with reference to the proposed spending of £59,000 on the undertaking. The report of Mr. Couzens gives the following particulars of the proposed expenditure:—River service pipework, £8,500; buildings, £9,500; turbo-alternator set, £14,000; boiler plant and auxiliaries, £12,400; pumps, tanks, pipework, &c., £3,100; coaling plant, £3,000; contingencies, £2,500; general mains, £6,000. As regards the river service pipework, the capacity at present is 950,000 gallons per hour from the river, which just covers existing requirements. The capacity included in the estimates is 1,500,000 gallons. As regards buildings, the estimates are for an addition of 65 ft. to the engine room and 80 ft. to the boiler room. With respect to the turbo-alternator set, one 5,000-KW. set is provided for complete with condenser and auxiliaries. If the extension is carried out on the lines proposed, it is anticipated that the plant can be installed, showing a saving of at least 15 per cent. over any at present in use. Apart from the consideration of cost, there was a necessity for the plant, as there would be at Christmas only a margin of 2,300 KW. With respect to the boiler plant and auxiliaries, a new arrangement of boilers is proposed, the effect of which would be to greatly economise buildings and floor space. The capacity of the existing boilers leaves no margin whatever for emergencies or excess load on the estimated figure at Christmas next. The coaling plant is inadequate, and it is proposed to install a telpher scheme beside the existing runway of the Temperley transporter, such telpher to deal with 60 tons of coal per hour. The item as regards general mains

2 min. 45⅘ sec. The tug-of-war produced the greatest rivalry between the various shops competing, and was won by "N" Department; "F N" team won the 1 mile relay; B. Knight the 100 yards' race (under 18); D. Young the 300 yards' handicap race for boys under 14 years, sons of employés; Miss N. McAlenon the 50 yards' skipping race, and Miss L. Kerry the 50 yards' thread-the-needle race. At the close of the events, Mrs. P. M. S. Brodie, wife of the president, presented the prizes to the successful competitors. During the afternoon a programme of music was rendered by the Graysilver Military Band, under the conductorship of Mr. J. H. Parnum. This band was formed about a year ago.

LIGHTING and POWER NOTES.

Aberdeen.—The Scottish office has suggested several changes in the provisional order applied for by the Corporation. Among them is the proposal that separate accounts should be kept for the refuse destructor and the adjoining generating station if one is erected. The Scottish office further suggests a clause providing that the cost of the electricity generated by the refuse destructor should not be less than the cost of production at the electricity station at Ferryhill. The Bills and Law Committee are to oppose the introduction of such a clause, as they consider it a far reaching one, especially as the Corporation had not decided definitely as to the utilisation of the power generated by the refuse destructor.

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South Africa.—A Bill is being introduced in the Natal Provincial Council, by the Natal Muncipal Association, to amend in certain respects an existing law and to provide for the supply by municipalities or local boards possessing power stations, of electric current outside their respective boundaries. This will principally affect Durban and Pietermaritzburg, where there are many industries just outside the respective boroughs.

Our readers will probably be aware of the time signal which is issued by the Durban municipality by momentarily lowering the electric light supplied from their power station at 8 o'clock each evening, the signal of the hour being given from the Observatory. This has so impressed the visitors from Johannesburg that that municipality has also followed on the same lines of indicating standard time all over that town.

The electric light plant at the Ladysmith works being taxed to its utmost capacity, it has been decided to increase the plant by the following:—One 240-H.P. engine, estimated cost, £900; two 75-KW. dynamos, estimated cost, £500; and instruments, £35.

The De Beers Co. has agreed to reduce its prices of electric current to the Kimberley Council, from 5½d. to 2¼d. per unit, on condition that the Council in its turn agrees to reduce the charge to private consumers to 6d. per unit.

Street lighting in Durban has taken a change for the better, and many improvements and extensions are to be taken in hand at once. The chief improvement is the substitution for the old enclosed arc lamps of 400 C.P. metallic lamps, and the adding of new lamps where the present lighting is insufficient. The present system of arc lighting by five in series does not lend itself to extensions so well as with the 400 C.P. lamp, which will burn off the A.C. mains, and the number of which on any one circuit is not restricted. It is estimated by this substitution to effect a saving of £400 per year. In the principal street in the town, however, it is suggested to change the enclosed arcs to flame arcs. For the suburban lighting the present 10-C.P. carbon lamps are being replaced by 32-C.P. "Osram" metallic lamps, while side-street lighting is also to be largely extended. The Durban Corporation intends to be well to the fore at the Agricultural Show to be held here in July next, as it is proposed to equip a model kitchen with heating and cooking apparatus, at which practical demonstrations will be given.

Stalybridge.—The Stalybridge, Hyde, Dukinfield and Mossley Joint Tramways and Electricity Board proposes to install another 2,500-KW. turbine plant at the generating station.

Swindon.—The T.C. has decided to apply to the L.G.B. for a loan of £3,510 for electricity purposes.

Thames Valley.—At the meeting of the Metropolitan Water Board on Friday, the Works and Stores Committee reported that proposals had been placed before it by the deputy chief engineer for an extension of the electric lighting system at the Hampton station and the electric lighting of the Surbiton station. At the Hampton station the total cost of the work, including the provision of the necessary plant, wiring, lamps, &c., would amount to approximately £1,400, and the upkeep of the new plant, together with the interest upon the capital outlay, would amount to approximately £260 per annum. As the cost of lighting this portion of the station by gas at the present time amounts to over £400 per annum, it will be seen that a considerable saving can be affected. The whole of the Surbiton station is at present lighted by gas, and it is proposed to install a dynamo and switchboard at a total cost, including lights, plugs, wall switches, the necessary foundations, steam pipe, &c., amounting to about £1,675. The average annual cost of the existing gas lighting amounts to £680, and the cost of maintenance of the proposed electric plant, together with interest on the outlay, would amount to about £320. The Committee stated that it concurred in the engineer's recommendations, and proposed that the work should be carried out by the board's workmen. This is to be done.

U.S.A.—Mississippi River hydro-electric energy for St. Louis, from the great dam being constructed across the river at Keokuk, Ia., is now positively promised for delivery in 1913. Financial arrangements for the first 120,000-H.P. portion of the undertaking are reported to be completed, and a large force of engineers, draughtsmen and labourers is now at work on the site. The plan involves ultimate developments of 200,000 H.P. and 300,000 H.P., with a 110,000-volt transmission line into St. Louis, 140 miles distant, and a power network furnishing hydro-electric energy to towns surrounding the development.

In connection with the proposed addition of about 10,000 street arc lamps to the 12,000 already in use in Chicago, the *Electrical World* says that a series A.C. 60-cycle flame-arc type of lamp is proposed, to burn on 60 volts at 10 amperes. The lamp will be enclosed, and the minimum burning hours will be 100. These lamps are classed by our contemporary as being between the ordinary flame arc and the old enclosed carbon arc lamp, and are stated to be probably the most powerful illuminant used for regular street lighting on a large scale in the United States.

Wadebridge.—The U.D.C. has accepted the tender of the E.L. Co. for public lighting on the Egloshayle side of the town.

Warmley.—The B. of T. has given notice that it has revoked the Warmley Electric Lighting Order, 1903, as from April 24th, 1911.

West Ham.—At the meeting of the Corporation on Tuesday, the Electric Lighting Committee reported having received an important communication from the electrical engineer with reference to the proposed spending of £59,000 on the undertaking. The report of Mr. Couzens gives the following particulars of the proposed expenditure:—River service pipework, £8,500; buildings, £9,500; turbo-alternator set, £14,000; boiler plant and auxiliaries, £12,400; pumps, tanks, pipework, &c., £3,100; coaling plant, £3,000; contingencies, £2,500; general mains, £6,000. As regards the river service pipework, the capacity at present is 950,000 gallons per hour from the river, which just covers existing requirements. The capacity included in the estimates is 1,500,000 gallons. As regards buildings, the estimates are for an addition of 65 ft. to the engine room and 80 ft. to the boiler room. With respect to the turbo-alternator set, one 5,000-KW. set is provided for complete with condenser and auxiliaries. If the extension is carried out on the lines proposed, it is anticipated that the plant can be installed, showing a saving of at least 15 per cent. over any at present in use. Apart from the consideration of cost, there was a necessity for the plant, as there would be at Christmas only a margin of 2,300 KW. With respect to the boiler plant and auxiliaries, a new arrangement of boilers is proposed, the effect of which would be to greatly economise buildings and floor space. The capacity of the existing boilers leaves no margin whatever for emergencies or excess load on the estimated figure at Christmas next. The coaling plant is inadequate, and it is proposed to install a telpher scheme beside the existing runway of the Temperley transporter, such telpher to deal with 60 tons of coal per hour. The item as regards general mains

is estimated to cover requirements for two years. The items most urgently needed are included in the following estimates:—River service pipework, £8,500; boiler plant and auxiliaries, £12,400; coaling plant, £3,000. The remaining items should not be delayed, but it is absolutely necessary, if the supply is not to be jeopardised and new business obtained, that some additional boiler plant should be in operation by next winter's load.

West Hartlepool.—At a meeting of the T.C. on the 2nd inst., the annual accounts of the electricity undertaking were submitted. Ald. Macfarlane, commenting upon them, said the gross revenue for the year was £7,475, or nearly 7¾ per cent. on the gross capital employed. Of this sum £3,454 had been apportioned to the redemption of debt, which had now been reduced by £32,000, and £2,517 represented interest, while £1 500 had been placed to reserve. They were, he stated, shortly to ask for a large increase of capital to extend the concern.

Wimbledon.—A Committee has been appointed to confer with representatives of the Wimbledon Traders' Association upon the request by the latter body that the price of current supplied for lighting arc lamps outside trade premises may be reduced. The Association suggests that a uniform system of outside lighting should be encouraged. It also advocates the desirability of discontinuing the present practice of turning out alternate lamps in the main roads at midnight. The electrical engineer reported to his Committee that he had made inquiries as to what demand for energy there was likely to be from the residents in that part of New Malden adjacent to Malden Station and the Malden police station; up to the time of writing 33 persons and firms had expressed their willingness to take a supply.

Wolverhampton.—The T.C. has decided to supply current for Coronation illumination at a flat rate of 1d. per unit, with a nominal charge of from 2s. 6d. to 5s. for connections. The devices must contain not less than 20 16-C.P. lamps, and must be alight from dusk until 10.30 p.m. from June 19th to 24th inclusive.

Yarmouth.—The accounts of the Corporation electricity undertaking for the past year, which were recently laid before the T.C., showed a gross trading profit, after charging £241 for the cost of converting certain public arc lamps to incandescents, of £8,267, of this amount £431 was written off the cost of meters, transformers, &c.: £7,466 applied to interest, sinking fund, rebates and discounts, and £370 added to the appropriation account, making £1,250. It was decided to add £982 10s. to the reserve fund, bringing it up to £4,000.

TRAMWAY and RAILWAY NOTES.

Argentina.—A petition has been made on behalf of a North American syndicate for a concession for electric tramways from the capital to the suburbs of Ensenada Los Talas, Tolosa, Abasto, Villa Elisa, &c., to be extended later to other suburbs.—*Review of the River Plate.*

Ashton-under-Lyne.—A scheme is being drawn up for the construction of a light railway from Ashton-under-Lyne to Bury. Parliamentary powers are to be applied for as soon as possible, a syndicate to be formed. The light railway will run across part of Ashton Moss to Failsworth, and then near Middleton to Bury. When the line abuts on any thoroughfare it will be run as an electric tramway system. Across the country it will be built as a light railway on the lines of the Blackpool to Fleetwood system.

Australia.—The Perth (W.A.) City Council has demanded a conference with the tramway company with a view to getting an improved service of cars. The company claims that the limited service results from the award of the Arbitration Court in the recent dispute with the employés.—*Australian Mining Standard.*

Bath.—In view of the extension of the city boundaries, the Somerset C.C. and the T.C. are to come to some fresh agreement with the tramways company in regard to repairs to roads in the rural districts in which the track is laid.

Blackburn.—The Union Assessment Committee has served notices of new assessment on the Accrington tramways situated within the Union area, the following being a comparative statement showing the old and new assessments:—Oswaldtwistle, £125 (old) and £191 (new); Clayton-le-Moors, £110 and £172; Church, £55 and £93. The town clerk has been instructed to take steps to appeal.

Bolton.—The gross profit on the year's working of the tramways amount to £52,974, while the interest and depreciation charges absorb £41,885, leaving a surplus of £11,089. The sum of £8,500 has been voted in relief of the rates, as compared with the estimate of £7,800. The amount of the depreciation fund is £56,370. Last year £7,800 was allocated in relief of rates.

Bournemouth.—The working of the Corporation tramways last year produced traffic receipts amounting to £89,696, an increase of £3,213; working expenses amounted to £57,579, an increase of £1,957. The revenue account shows a gross profit of £32,018, and after providing for financial charges, rent of leased lines, &c., a net loss of £153 resulted.

Continental Notes.—Turkey.—La Société Imperiale Ottomane de Tramways et d'Eclairage Electrique has applied for a concession for a further 2 km. of electric tramways in the town of Damas.

Holland.—The *Nieuwe Rotterdamsche Courant* of April 29th announces that a project is on foot for the construction of an electric tramway from The Hague to Leyden *viâ* Wassenaar. The total length of the line is 11 miles. It is proposed to obtain power from The Hague central generating station.—*Board of Trade Journal.*

Belgium.—A special department has recently been established at the works of the Société des Ateliers de Constructions Electriques, at Charleroi, for the manufacture of electrical signalling apparatus for railways.

Germany.—A scheme is at present receiving consideration, for the construction of an electric tramway between Hattingen and Strepel, Westphalia.

Saxony.—A concession has lately been granted for the construction and working of an electric tramway between Oelsnitz and Gersdorf.

Denmark.—The municipal authorities of Copenhagen have decided to take over the working of the electric tramways in the Danish capital from August 1st next. The tramway company will, however, continue to work the Tuborg suburban line, and also the power station for the supply of electrical energy for lighting and power purposes.

Croydon.—The B.C. had before it on Monday a voluminous report by the tramways manager, on which the Committee recommended that neither ½d. or 1½d. fares should be adopted. The manager calculated that ½d. fares would mean a yearly loss of £7,995, to make up which it would be necessary to carry 3,837,600 ½d. passengers in a twelvemonth. He was convinced that ½d. fares would greatly endanger the financial stability of the undertaking. Information concerning 87 other systems was obtained, with the following results:—(1) The opinions of the managers of 18 systems which have wholly adopted ½d. fares are that while such are considered a convenience, they do not increase the receipts, but rather the opposite; (2) the majority of the managers of the nine systems which have partially adopted ½d. fares express the opinion that they are decidedly unremunerative; (3) the managers of 60 systems which have not adopted ½d. fares, are strongly opposed to their introduction. In short, Mr. Goodyer believed that the introduction of ½d. fares in Croydon would be "a direct route to a tramway rate." Proposals to shorten fare stages, the Committee, for the present, holds in abeyance. The Committee recommended the re-opening of the White Horse Road section, which was closed when it was found that during the year ended March, 1908, it had shown a loss on the working of £2,150. The debate on the report and recommendations was adjourned.

Dundee.—By a majority of 17 to 9, the T.C. has approved of the penny-all-the-way fare for the tramways, and that the halfpenny fare stages be fixed at 880 yards. All preferential fares, with the exception of passes to the blind and nurses, are to be discontinued. Opponents of the system characterise the Council's action as revolutionary, and predict its failure.

Liverpool.—Excavation has commenced at Litherland as preliminary to the construction of the proposed Seaforth and Sefton Junction electric railway, which is to connect the Liverpool Overhead Railway with the Cheshire Lines, thus forming a new route between the Dingle and Southport Lord Street. The period of construction will not exceed two years.

London.—L.C.C.—The removal of sludge from the conduits of the Northern and Southern tramway systems cost some £4,800 during the year ending January 21st last.

According to the *Daily Mail*, an agreement, with a view to issuing interchangeable tickets, has been come to by the Underground and tube railways, London United Tramways and London General Omnibus Co., and a joint committee is being formed to settle the details of the scheme. This arrangement is of considerable interest, in view of the proposal to form a company with £1,000,000 capital, to introduce the K.P.L. (petrol-electric) 'bus on the London streets.

Malvern.—The U.D.C., by resolution, has adhered to its opposition to the Electric Traction Bill, which provides for railless trolley cars.

Merthyr Tydfil.—The Electric Traction and Lighting Co., in consideration of the Council deferring the exercise of the powers to purchase the undertaking, has decided to extend the tramways to Cefn Coed.

Rotherham.—The annual report of the engineer and manager of the tramways department, states that the traffic receipts had increased to £33,313, an actual increase in fair comparison on the previous year of £1,568. The power expenses had increased from 2·72d. per car-mile to 2·78d., and the traffic expenses had decreased to 2·89d., a difference of ·16d. per car-mile. Altogether the total cost of working the system had been reduced from 8·04d. per car-mile last year to 7·79d. per car-mile this year. The gross profit was £9,883, against £8,915, while the net revenue was £3,048, as against £3,807 last year. After crediting £598 as contributions from the electricity department, the decrease as against last year was £161, and, considering the loss to the department due to the laying of the Broom Road route, he thought the results very satisfactory.

South Africa.—A proposal has been made to link up the tramway systems of Johannesburg and Pretoria.—*British and South African Export Gazette.*

Todmorden.—During last year the Corporation motor-'buses carried 699,000 passengers, against 614,107 in the previous 12 months. The 'buses ran 82,202 miles, against 73,135, and the receipts were £4,569, against £4,060. The expenses totalled £4,433, which, with capital charges of £1,056, made a gross total of £5,489. The traffic receipts were £4,574, and other income £113, or a total of £4,687, leaving a deficit of £812 on the year.

West Hartlepool.—At a meeting of the T.C. on the 2nd inst., the result of the recent arbitration, relating to the purchase price of the Park and Foggy Furze sections of the tramways, was announced. The price originally asked by the local company was £22,000; the arbitrator awarded £12,096, and ruled that the company should pay three-fifths of the cost of the arbitration proceedings.

Yarmouth.—The accounts of the Corporation electric tramways for the year ending March 31st last were laid before the T.C. at its last meeting. The gross profit was £8,126, as compared with £6,588 for the previous year. Bank interest was £84; interest, sinking fund and income-tax amounted to £6,760; leaving £1,450 to be added to the appropriation account, as compared with £68 the previous year, and making that account £1,817. The sum of £113 was appropriated for electricity meters, and £1,250 for the general renewal fund, which now amounts to £5,633. The third-party insurance fund stands at £1,491, and the total sinking-fund accumulations at £16,600.

TELEGRAPH and TELEPHONE NOTES.

Atlantic Cables.—In the House of Commons Sir Gilbert Parker asked the Postmaster-General whether negotiations had been completed or were in course of completion for the transference of the control of the Anglo-American Telegraph and the Direct United States Cable Companies to an exclusively American financial group; and if so, whether the Government intended taking any steps to prevent the cable communication with North America from being entirely dependent upon the operations of an American combine. —Mr. H. Samuel replied that negotiations were understood to be in course of completion by which the practical control of the Anglo-American Cable Co.'s business would pass to the Western Union Cable Co., of the United States of America, with which the Anglo-American Co. had formerly a working agreement. So far as he was aware no such negotiations were being carried on with the Direct United States Cable Co. The new arrangement would not result in the cable communication with North America being entirely dependent upon the operations of an American combine.

Replying to a further question by Mr. Touche, Mr. H. Samuel said his attention had been called to negotiations having for their object the transfer of the control of the American Telegraph Co. to an American group, and he was taking steps, by arranging for the Government to have certain powers of control over the rates for trans-Atlantic cable messages, and by other measures, to secure that no British interests should suffer. They were obtaining a very large measure of control for the first time over the rates to be charged upon the Atlantic cables.

China.—The Chinese Board of Communications has obtained an advance of half a million sterling, at 5 per cent., from the Eastern Extension and Great Northern Telegraph Companies, on account of payments to the Chinese telegraph authorities under agreements with the companies; the money is required for the reorganisation and development of the Chinese Imperial telegraph and telephone services.

Communication with the Continent.—In reply to a deputation from the Liverpool Chamber of Commerce and other important commercial bodies, which urged the desirability of an accelerated telegraphic service to the Continent, by the installation of additional direct wires, and the introduction of "urgent" telegrams, Mr. Herbert Samuel said he was by no means satisfied with the service between the chief commercial centres of England and the Continent. Improvements had been effected by the adoption of a new apparatus, and the average delay was now 3½ minutes, but he proposed to divert a large part of the business to other wires through the Central Telegraph Office, and thus to relieve the direct wires. It was a mistake to suppose that the multiplication of direct wires would necessarily ensure rapidity of service.

Constantinople.—The telephone contract has been signed by Djavid Bey and Mr. Webb, who has returned to London to put in hand the organisation of the company and of the necessary engineering staff.

Siberia.—A Bill has been submitted to the Russian Duma providing for improved telegraphic communication between Western Siberia and Western Europe, and contemplating the erection of four wireless telegraph stations on the shores of the Kara and White Seas. It is proposed to spend 160,000 roubles this year and 180,000 roubles next year for this purpose.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—May 19th. Six 60-K.V.A. single-phase transformers, for the Melbourne City Council. See "Official Notices" April 28th.

May 26th.—(*a*) 1,024,000 arc lamp carbons, (*b*) 6,000 metal-filament lamps, for the Melbourne City Council. See "Official Notices" April 28th.

May 30th.—One portable petrol-driven desiccating plant, for the P.M.G.'s Department in Victoria. See "Official Notices" April 7th.

May 31st.—7,000 insulators and wire and line material, for the P.M.G.'s Department in South Australia. See "Official Notices" April 7th.

June 7th.—Two nauts of submarine cable, single core, for the P.M.G.'s Department in New South Wales. See "Official Notices" April 28th.

June 14th.—Switchboard, common-battery, multiple, for the P.M.G.'s Department in South Australia. See "Official Notices" February 3rd.

June 14th.—Branching multiple magneto lamp-signalling switchboard, for the P.M.G.'s Department in Victoria. See "Official Notices" February 3rd.

June 14th.—Cable, ironwork, cast-iron pipes, iron or steel poles, phosphor-bronze wire, &c., for the P.M.G.'s Department in Queensland. See "Official Notices" May 5th.

June 27th.—1,400 protectors for use on main distributing frames at magneto exchanges, for the P.M.G.'s Department in Victoria. See "Official Notices" May 5th.

July 25th.—Deputy-P.M.G., Melbourne. Twelve sections of a branching multiple magneto lamp signalling switchboard, &c., or one automatic or semi-automatic switchboard, for the P.M.G.'s Department in Victoria. See "Official Notices" March 24th.

Blackpool.—8,000 tons of clean rough slack for a year, for the Corporation electricity works.

May 15th.—Electric wiring of new Central Library, Queen's Square, for the T.C. Chas. Furness, borough electrical engineer.

Bradford.—May 13th. Electrical installation at the new department of textile industries, dye-house, power house, &c., at the Technical College, for the T.C. City Architect, Town Hall.

Brazil.—Respecting the recent call for tenders for the establishment of telephonic communication betwen Rio de Janeiro and São Paulo, the British Acting Consul-General at Rio (Mr. E. Hambloch) reports that this competition has been annulled, and that the Minister of Public Works has given orders for fresh tenders to be invited.—*Board of Trade Journal.*

Bulgaria.—May 24th. Rustchuk municipal authorities. Electric light and power installation. Tenders to Stadtverwaltung Rustchuk, Rustchuk. Upset price about £26,000, and a deposit of 5 per cent. will be required to qualify tenders.—*B. of T. Journal.*

Canada.—Toronto.—June 6th. Board of Control, City Hall. (1) Pumps and electrical equipment for the city main drainage works; also (2) screening, elevating and conveying apparatus, and (3) castings and indicating and recording apparatus for Venturi meters. Specifications, forms of tender and deposits required for each of the three sections, at the Board of Trade Commercial Intelligence Department in London.

Carlisle.—May 17th. 1000-ampere battery, boosters and switchgear, for the Corporation. See "Official Notices" to-day.

Denmark.—May 23rd. 3,000 electric meters, for the Copenhagen Corporation Lighting Department. Conditions can be seen at Board of Trade Commercial Intelligence Dept., London.

Eccles.—May 22nd. Coal for a year, for the T.C. Borough Electrical Engineer, Cawdor Street, Patricroft.

Exeter.—May 15th. 2,000 tons of washed bean or pea steam coal for the Corporation Electricity Works, for alternative periods of six or twelve months. H. Lloyd Parry, Town Clerk.

Gravesend.—2,500 tons of rough small coals for one year for the B.C. Electricity Committee. C. F. McInnes, electrical engineer.

Halifax.—May 20th. Concrete dam at the electricity Works, for the T.C. Jas. Lord, borough engineer (returnable deposit of £5).

Handsworth.—May 22nd. Steam coal for the Electric Supply Department of the U.D.C. F. A. Nixon, electrical engineer.

Hornsey.—May 19th. Water-tube boiler, automatic stoker, piping, &c., for the T.C. See "Official Notices" May 5th.

Italy.—SPEZIA.—June 2nd. Electric cables and wires, for the Naval Authorities. Value £1,420; deposit £140. Local representation. Specification at Board of Trade Commercial Intelligence Department, London.

Leyton.—Electrical illumination of the Town Hall and two branch libraries on Coronation Day, for the U.D.C. See "Official Notices" May 5th.

London.—St. Pancras.—May 15th. (*a*) Three-phase high-tension cable, (*b*) stoneware ducts, for the B.C. See "Official Notices" April 28th.

Hackney.—May 25th. 100,000 pairs of yellow flame arc lamp carbons, for the B.C. See "Official Notices" May 5th.

Hammersmith.—Feed-water heater (£250 estimated) required in connection with the steam plant extensions at the Electricity Works.

New Zealand.—June 12th. Regarding the scheme for the extension of the Wanganui municipal power station, a report has been received from the office of H.M. Trade Commissioner for New Zealand to the effect that tenders are now invited by the Wanganui Borough Council for the supply and erection of power-house plant for the Corporation tramways. Separate tenders may be submitted for (1) engine, generating and gas-producing plant, and (2) battery and booster. Deposit, £300 with each tender. Local representation is necessary. A copy of the specification should be seen at once at the Commercial Intelligence Branch of the Board of Trade, London, E.C.

Rhondda.—May 19th. Waterworks plant, including water turbine motor and dynamo, and lighting of the works, for the U.D.C. J. Vevers, Waterworks Offices, Treherbert, Rhondda.

South Africa.—The acquisition of an electrical hoist of considerable capacity is under consideration by the management of the City and Suburban Mine, together with plant for providing power for the hoist and for pumping from the lower levels.—*British and South African Export Gazette.*

South Shields.—May 24th. One 1,500-kw. high-pressure impulse-type steam turbine, with surface condenser and pumps, coupled to one 1,000-kw. d.c. generator, with switch panel and instruments, and one 1,100-kw. a.c. generator, with switch panel and instruments, in tandem, for the Corporation. See "Official Notices" April 21st.

Spain.—The municipal authorities of Barcarrota (province of Badajoz) have just invited tenders for the concession for the electric lighting of the town during a period of ten years.

Swansea.—The T.C. is to invite tenders for motor and starting switches, for one or two years.

Wallasey.—May 16th. One motor wagon with trailers for the Electricity Department of the T.C., for the haulage of coke. J. A. Crowther, engineer and manager.

CLOSED.

Australia.—The *Australian Mining Standard* reports the following contracts placed by the P.M.G.'s Dept., Victoria :—

George Sweet, East Brunswick.—12,600 conduits, glazed earthenware, four ducts, at 2s. 5d. each—£1,522.
Richard Taylor, Melbourne.—6,150 conduits, cement concrete (12,300 lineal feet), six ducts, at 1s. 8d. per lineal foot—£1,025.
Western Electric Co. (Australia), Ltd.—Items for £250 and £15.
Chappel & Nichols, Castlemaine.—£1,598.
Lawrence & Hanson, Sydney.—Various items, total £540.
J. A. Newton & Co. Pty., Ltd., Melbourne.—150 telephones, open circuit, condenser, at £3 5s. 1d. each—£488.

The same exchange states that a contract has been secured by Mr. W. C. Rowe, of Melbourne, from the Melbourne City Council for the supply of 6,000 50-c.p. "Pope" metal-filament lamps. Mr. Rowe is sole representative in Australia of the Pope Electric Lamp Co., Ltd., of Willesden, London.

The Prahran-Malvern Tramways Trust has accepted the tender of Noyes Bros. (Melbourne) Proprietary, Ltd., for steel rails, fish-plates, fastenings and bonds for the construction of the Dandenong Road line, the price being £6,624.—*Australian Mining Standard.*

Bacup.—The T.C. has accepted the tender of Messrs. W. T. Glover & Co., Ltd., for distributing cable.

Belgium.—Eight firms—six German and two Belgian—competed for the contract for the supply and laying of electricity mains for the municipal authorities of Ghent, the lowest tender being that of Messrs. Felten & Guilleaume, of Mulheim-am-Rhine.

Bradford.—The Corporation Technical College and School of Art Sub-Committee has accepted the tender of Messrs. Steinthall & Boydell, Ltd., for an additional panel for switchboard, at £40 10s.

Burnley.—The Tramways Department has accepted the following tenders :—

United Electric Car Co.—Three single-deck car bodies.
British Thomson-Houston Co.—Electrical equipment for the cars.
A. McBean & Son.—Rails for the extension to Harle Syke.
Watlington & Co.—Overhead equipment.

Bury.—The Electricity Committee is placing contracts with the following for work at the power station :—

Wiring and lighting.—Siemens Bros Dynamo Works, Ltd.
Weighing machine for railway trucks.—Henry Pooley & Son, Ltd.
Three-inch centrifugal pump.—Mather & Platt, Ltd.

Cheltenham.—The T.C. has accepted the tender of Messrs. Aiton & Co. for steam-piping for the motor-generator, at £200; Messrs. Babcock & Wilcox tendered at £230. The Council has also accepted the tender of Messrs. Beattie & Co., of Middlesbrough, for a Taylor & Scotson regulator, at £95.

Dewsbury.—The Corporation has accepted the tender of the Union Cable Co., for distributing cable.

Durban.—In connection with the rapid growth of power supply in Durban, tenders have been accepted from the following firms for cable :—

Siemens cable.—Barache & Kleudjen, 900 yards of ·25, armoured, single, paper-insulated, £151.
T.M. Co. cable.—T. Barlow & Sons, 6,600 yards of ·3, armoured, single, paper-insulated, £1,317; 400 yards of ·5, ditto, £127; 500 yards of ·75, ditto, £83.
Callender cable.—Sykes & Co., 8,000 yards of 6,600-volt, three-phase, paper-insulated, £2,384.

Govan.—The Corporation has accepted the tender of the Bastian Meter Co., Ltd., for 1½ and 3-ampere meters, for the year.

Leigh.—The following tenders have been accepted by the Council for the plant extensions at the electricity works :—

One 500-kw. direct-coupled high-speed reciprocating steam generator.—Messrs. J. Howden & Co., with Bruce Peeb'es generator.
One evaporative condenser capable of dealing with 20,000 lb. steam per hour.—Messrs. Edward Deane & Beal, Ltd.
Extensions to switchboard.—Messrs. Whipp & Bourne, Ltd.
Girder work for extension of crane.—Messrs. McGregor Bros.

The tender of Mr. John Boydell (£847) has been accepted for the labour and materials required for the extension of the Corporation electricity works.

London.—St. Pancras.—The B.C. has accepted the following tenders :—

Sloan Electric Co., Ltd.—112,500 of 12-in. arc lamp carbons and 37,500 pairs of 10-in. carbons, at £470 15s. 7d.
Siemens Bros., Ltd.—37,500 pairs of 12-in. carbons and 12,500 pairs of 10-in. carbons, at £265 18s. 9d.
Wm. Giepel & Co.—"Oriflamme" carbons for flame arc lamps, £34 4s.; "Luna" carbons, £13 6s. 3d.
Union Electric Co.—"Gilbert" carbons, £55; "Excello" duplex carbons, £37 7s.; "Excello" cored carbons, £20 6s.

Deptford.—The tender of Messrs. Wilkins & Son, New Cross, for electric light fittings, &c., for the New Cross branch library, at £32, is recommended for acceptance.

Hammersmith.—The Electricity Department recommends the purchase of a new adding machine, capable of carrying out four operations at one time, for £105, from the Burroughes Adding Machine Co.

L.C.C.—Messrs. Williamson Cliff, Ltd., of Stamford, have received the order for fireclay, &c., for the Greenwich generating station.

For points, junctions and cross-overs, required during the year at certain places on the tramway system, Messrs. Hadfield's Steel Foundry Co., Ltd., have received the contract at £13,246.

The Highways Committee has arranged for the cables and sub-station plant for the Herne Hill to Brixton tramways, from the British Insulated & Helsby Cables, Ltd., and Messrs. Johnson and Phillips, Ltd., respectively, and also for the feeder pillars required, to be supplied from stock at a cost of about £1,860.

Luton.—The T.C. has accepted the tender of the Brush Electrical Engineering Co., Ltd., for a 650-kw. exhaust steam turbo-generator, at £2,495, and a 400-kw. ditto, at £1,913. Seven tenders were received, the highest for the 650-kw. plant being £3,785, and the highest for the 400-kw. £2,299.

The T.C. has also accepted the tender of the Rees Roturbo Manufacturing Co., Ltd., for a pump, at £363; and that of Messrs. Babcock & Wilcox, Ltd., for a tube cleaner, at £11.

Malvern.—The U.D.C. has accepted the tender of the South Wales and Cannock Chase Coal Co. for coal for the electricity works.

Mossel Bay (Cape Colony).—The Municipal Council has accepted the tender of the British General Electric Co., Ltd., for an installation of electric light in the new wool store and concert hall and rink.

Salford.—The T.C. has accepted the approximate estimate of the general manager of the Tramways Department for providing and fixing the wires, &c., in connection with the new fire-alarm system, at £499; also, in addition, the payment to the Tramways Committee of £25 per annum as an acknowledgment of the privilege of attaching the wires to the tramway standards; also their offer to maintain the lines and fittings (excluding the boxes) for £15 per annum. The Council has accepted the tender of G. Longfield-Beasley, at £2,131 10s., to furnish and install a Gamewell Co.'s system of fire-alarm and police telegraph in the borough. It has further accepted the following tenders for annual supplies to the Tramways Department :—

W. T. Henley's Telegraph Works Co., Ltd.—Rubber strip, &c.
India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.—Tape.
Electrical Co., Ltd.—C.C. meters, 100, 200 and 300-ampere sizes, schedule of prices.
Chamberlain & Hookham, Ltd.—C.C. two-wire meters, 1½ to 50-ampere sizes (part contract), £230.
Ferranti, Ltd.—C.C. two-wire meters, 1½ to 50-ampere sizes (part contract), £210; a.c. meters, £290.
Brush Electrical Engineering Co., Ltd.—Carbon lamps, schedule of prices.
L. Andrew & Co.—Mica sheets, rubber gloves.
North British Rubber Co., Ltd.—Rubber overshoes.

Shipley.—The U.D.C. has accepted the tender of Messrs. E. Green & Son, Ltd., for an economiser for the electricity works.

Sheffield.—The T.C. has accepted the following tenders :

Wellerman Bros.—Alterations and additions to sub-station in Chapel Lane, £697 ; erection of sub-station, Jobson Road, £289.

Ferranti, Ltd.—Switchboards for Chapel Lane sub-station and Princess Street sub-station, £1,832 11s.

W. T. Glover & Co., Ltd.—100 tons of electrolytic copper wire bars and 200 tons of lead (to be made up into cables as and when required within two years from placing the order), at current prices.

St. Helens.—The Electricity Committee has accepted the tender of the Worthington Pump Co., Ltd., for a centrifugal pump.

Tonbridge.—The U.D.C. received the following tenders for electric pumping plant at the sewage-disposal works :—

Gwynnes, Ltd.	(accepted)	£1,045
Seale, Austin & Barnes		985
British Electric Plant Co.		1,035
		1,098

For electricity supply mains the tenders were :—

Western Electric Co.	(accepted)	£1,032
Glover & Co...		1,061

The Council has also accepted the tender of Messrs. Seale, Austin and Barnes, Ltd., for wiring, &c., for the electrical illumination of the Castle grounds ; and that of the Western Electric Co., Ltd., for cables for ordinary purposes.

Torquay.—The T.C. received 15 tenders for the supply of additional machinery at the generating station. The quotation of the British Thomson-Houston Co., Ltd., was accepted for the bulk at £4,601, and the tender of the Brush Electrical Engineering Co. was accepted for the balance at £295 10s. The tender of the Lea Recorder Co. was also accepted, at £42 10s., for the supply of apparatus for continuously and automatically measuring the steam consumption.

Wolverhampton.—The Tramways Committee of the T.C. has accepted the tender of Hadfield's Steel Foundry Co., Ltd., for special tramway points and crossings, at £411.

The Electricity Committee has accepted the tender of the Holly Bank Coal Co., Ltd., for coal, and that of Messrs. Lucy & Co., for 300 street lamps with brackets

FORTHCOMING EVENTS.

Iron and Steel Institute.—Friday, May 12th. At 10.30 a.m. At the Institution of Civil Engineers. Annual meeting. Connaught Rooms, 7.15 p.m. : annual dinner. Saturday, May 13th.—Annual meeting continued.

Physical Society.—Friday, May 12th. At 8 p.m. At the Imperial College of Science, South Kensington. Papers on "Stream Lines Past the Elliptic Cylinder and Magnetic Interpretation," by Sir G. Greenhill and Col. R. E. Hippisley ; "The Method of Constant Rate of Change of Flux as a Standard for Determining Magnetisation Curves of Iron," by Messrs. J. T. Morris and T. H. Langford ; and "Demonstration of an Electric Thermo Regulator," by Prof. H. L. Callendar.

Institute of Metals.—Friday, May 12th. At 8.30 p.m. At the Institution of Mechanical Engineers. Lecture on "The Hard and Soft States in Metals," by Dr. G. T. Beilby.

Institution of Electrical Engineers (Glasgow Local Section).—The annual general meeting, announced for May 9th, has been postponed until Tuesday, May 16th.

Institution of Electrical Engineers.—Thursday, May 18th. At 8 p.m. Paper on "Automatic Telephone Exchange Systems," by Mr. W. Aitken.

Chemical Society.—Thursday, May 18th. At 8.30 p.m. Paper on "Electrolytic Reduction : IV, Aromatic Aldehydes," by Mr. H. D. Law ; and other papers.

Association of Engineers-in-Charge.—Saturday, May 20th. At 7.30 p.m. At the St. Bride's Institute, E.C. Further discussion on "Steam Plant Manipulation."

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

THE following orders are issued :—

Commanding Officer—COL. H. M. LEAF.

Friday, May 12th.—"D" Company. Recruits' infantry drill, 7 to 8 p.m. ; technical drill, 7 to 10 p.m.

All Companies.—Annual course of musketry, detail as for Wednesday, the 10th.

(Signed) P. H. CAMPBELL, Capt. and Adjt., L.E.E.

Non-Magnetic Compass.—A new compass which is capable of resisting the influence of masses of steel has been installed in the battleship *Collingwood* at Devonport, for trials under varying weather conditions, and as to its ability to withstand the concussion of heavy guns. The new compass owes its immunity from disturbing influences to the application of the gyroscopic principle, which, acting on the system of which the needle is part, ensures its retention in the true position. The control and adjustment of the compasses of modern war vessels has become a matter of considerable difficulty, owing to the almost entire elimination of wood from the construction, and the adoption of an upper deck armament of guns of exceptional length, together with thickly-armoured conning, director, and signalling towers. All these act as disturbing factors to the compasses in their vicinity. The use made in recent years of non-magnetic steel in the conning towers, and of metal in the chart-houses and on the upper bridges to neutralise the disturbing effects of large quantities of steel, has been attended with considerable success, but it has been felt that an alteration in the design and construction of the compass itself is needed, and the Admiralty has intimated that an improved compass would be welcomed.

NOTES.

Electrical Fatalities.—On 3rd inst. an inquest was held at Peak Dale, near Buxton, on the body of Hamlet Tattersall (52), who met his death on the previous Monday. Deceased was employed by Messrs. W. Shepherd & Son, asphalters, Rochdale, and had been at the works in Peak Dale for two months. Those present included Mr. Nevitt (Inspector of Mines and Factories), and Mr. C. H. Spafford, representing the owners of the electrical wires, the Buxton Lime Firms, whose works adjoin those of Messrs. Shepherd. Harold Shepherd, Rochdale, said that he was working on the premises, and there were eight other men inside the building. About 20 minutes to 12, witness went on the roof with the deceased for the purpose of inspecting it, as rain had been coming through. Witness pointed out the electric wire to Tattersall, and drew his attention to a machine that was working a little distance away down the line, indicating that the electrical current was on. They discussed this fact, said the witness, as for the previous two or three days the current had been off. Witness then turned his back on the deceased for the purpose of doing the work of repair. In a second or two witness heard Tattersall shouting, and on turning round found that he had hold of one of the wires with both hands. There were three wires, the nearest of them being 2 ft. 5 in. above the roof. The wires were about 18 in. apart. Witness seized Tattersall and pulled him off, but could not see any sign that he was living. Witness could not give any reason why deceased should have taken hold of the wire, unless he did it out of curiosity to see whether the current was on or off. The roof was not slippery.

Mr. Nevitt : There seems to have been some disagreement between you about the current ?

Witness : Yes ; he contradicted me by saying the current was not on.

Answering further questions, Witness said he distinctly told the deceased not to touch the wires whether they were "on" or "off." He thought that Tattersall had accepted his statement that there was current in the wires. In the work on which they were engaged it was not necessary to touch the wires.

Mr. Wood (a juryman) said it seemed to him from the evidence that had been given that deceased slipped and caught hold of the wires with both hands to prevent himself falling.

John Clayton, an electrician in the employ of the Buxton Lime Firms, stated that if the deceased had only caught hold of one wire he would not have got a shock. He must have caught hold of two wires. The current was 500 volts.

The Coroner suggested that the wires should be taken high above the roof, so as to make it impossible for anyone to hurt himself by touching them.

The Coroner, in summing up, said it seemed that there had been a little disagreement as to whether the current was on or off, and that it had led the deceased to touch one of the wires. They had only the evidence of one man who did not know the actual cause of the accident. What the jury had really to consider was whether they ought to make a recommendation for the future that the wires should be carried at such a distance from the building that they could not be touched.

Mr. Farrow : If the wires had been covered the accident would not have occurred. I am of opinion that the deceased slipped.

The Coroner thereupon recalled the electrician, who stated that the insulation on wires perished very soon and then became a sort of trap to the men who had been accustomed to touching them.

The jury returned a verdict of accidental death, at the same time recommending that the wires should be raised so that they could not be touched from the building.

An evening paper states that two men were killed by electric shock at the Powell Duffryn Co.'s colliery at Aberaman on Tuesday.

The Gas Industry "Rapidly Becoming Obsolete."—In the course of a discussion following the reading of a paper by Mr. Paish, editor of the *Statist*, on "Savings and the Social Welfare," at a meeting of the Sociological Society held on May 2nd, Mr. Chiozza Money, the well-known economist, expressed the opinion that too much capital was being sent out of the country. It was the investment of the individual, he said, which sometimes benefited society. And yet they had to bear in mind what frequently stood in the way of that investment. What, for example, was the cause of the slow progress electricity had made in this country ? It was not far to seek. Vested interests stood in its way. The existing gas company and its shareholders, the municipal corporation possessing a gas undertaking, and kindred interests had to be duly considered. A large amount of capital had been sunk in an industry which was rapidly becoming obsolete, and this fact was allowed to stand in the way of the progress of a newer and more modern enterprise. Vested interests, then, barred the progress of electricity.—Mr. Paish, replying to Mr. Chiozza-Money, took exception to the statement that the vested interests of the gas concerns were obstacles in the way of electrical progress. Gas was cheaper in this country than anywhere else. Coal could be got easily and economically to produce it ; and there was not the same inducement to establish electrical installations as in other countries where fuel was dear, and where electrical power could be produced very cheaply in a variety of ways, often by water-power.

Institution and Lecture Notes.—THE CONCRETE INSTITUTE.—On Monday last week the first of a series of free educational lectures on the subject of reinforced concrete was delivered by Mr. R. W. Vawdrey, B.A. ; the remaining lectures of the course are being delivered on Wednesdays at 5.45 p.m. in the

Lecture Hall of the Concrete Institute at Denison House, 296, Vauxhall Bridge Road, S.W. Tickets of admission may be obtained free on application to the Secretary, Mr. H. Kempton Dyson.

The two days' summer meeting, in connection with which there will be a conversazione and the first annual dinner of the Concrete Institute, will be held in London on June 7th and 8th.

The Faraday Society is holding a general discussion on "High Temperatures" on Tuesday, May 23rd, at 8 p.m., at the Institution of Electrical Engineers. A full programme of papers has been arranged, and Dr. R. T. Glazebrook, F.R.S., Director of the National Physical Laboratory, will preside. During the afternoon of May 23rd the society, by the kind invitation of the director, will visit the National Physical Laboratory to inspect the high-temperature equipment; experimental demonstrations will be arranged by Dr. Harker and Mr. Greenwood, in connection with their contributions to the general discussion. Those desirous of visiting the Laboratory, or of being present at the discussion, are asked to communicate with the Secretary of the Faraday Society, 82, Victoria Street, Westminster, London, S.W.

Benefit Concert.—We are pleased to learn that the Electrical Trades Union (West London Branch) Benefit Concert, which was held at Fulham Town Hall, on Saturday, May 6th, as announced last week, was a great success. It was held on behalf of Bro. Jim Foote, who was so seriously injured 12 months ago while connecting up a transformer at one of the Strand hotels, that there is little hope of his regaining the use of his right hand. Mr. F. Alford writes:—"Recognising the precariousness of his position, the best instincts of our members have come to the fore in a magnificent manner. Over 1,000 tickets have been disposed of, the hall well filled, a splendid programme arranged by Bros. Fawdry and Bevan was gone through, and after a few words from Mr. J. Farrier the audience dispersed highly delighted that they had combined pleasure with a charitable act. I thank you and your subscribers for the help rendered."

Parliamentary.—In the House of Commons on May 8th, the Winchester Corporation (Electric Supply) Bill, and on Tuesday, the Sidmouth Gas and Electricity Bill were read a second time; and in the House of Lords on May 4th, the London United Tramways Bill, Liverpool Overhead Railway Bill, Metropolitan Electric Supply Co. (Acton District) Bill and Nottinghamshire and Derbyshire Tramways Bill, and on May 9th the Central London Railway Bill, were read a second time.

L.C.C. TRAMWAYS BILL.—A Select Committee of the House of Commons during last week considered the Tramways and Improvements Bill promoted by the L.C.C. The proposals first submitted to Parliament at the beginning of the session have been greatly reduced, owing to the Council failing on Standing Orders, consequent on the refusal of several local authorities to give their consent. The proposals left in the Bill involve an expenditure of £750,000 for construction and street widenings. Having heard evidence, the Committee passed the proposals, which include the following:—Tramway No. 10, running from London Road to Forest Hill, and wholly in the borough of Lewisham; the line joins up two existing tramways to get rid of double termini. Tramway No. 11, which will commence in Stanstead Road, Lewisham, and pass along Catford Hill and Catford Road to Rushey Green. Tramway No. 9, which will commence by a junction with the existing tramway in Grove Lane and pass along Grove Lane to Dog-Kennel Hill, and terminate in Grove Vale. Tramway No. 15, to commence in Seven Sisters Road by a junction with the existing line of the Metropolitan Electric Tramways, Ltd., and to pass along Blackstock Road and Finsbury Park Road to join the Council's existing tramways. Tramway No. 15A, which is a loop-line through Blackstock Road. Tramway No. 8, to run from Bond Street to Archer Street, Vauxhall, was withdrawn.

Electrical Trades Benevolent Institution.—The following is a list of donations and susbcriptions received since the Festival Dinner, up to the 6th inst.:—

	Subscriptions	Donations.
Pope's Electric Lamp Co., Ltd.		£1 1 0
Icke, J. R.		0 2 6
Nalder Bros. & Thompson, Ltd.	£5 5 0	
Wild, Lancelot W.	1 1 0	
Wild, Lancelot W.		2 2 0
Hawtayne & Zeden	1 1 0	
Bassett, Chas.		1 1 0
Hornsby, Richard, & Sons, Ltd.		1 1 0
Flower, J. W.		0 10 6
Avery, J. H.		0 10 6
Plumtree, J. S.		0 10 6
Concordia Electric Wire Co., Ltd.	3 3 0	
Electricity		1 1 0
Grant from the Electrical Exhibition, Olympia, 1905		378 12 8

A further list will be published next week.

Bequest.—The late Mr. John Spencer, of Wednesbury, bequeathed £5,000 to the University of Birmingham, to be applied in the advancement of science. The gross value of his estate was £38,000 and the net personalty £35,802.

Concert.—Quite a large gathering of the officials, staff and employés of the Metropolitan Electric Tramways, Ltd., and their friends, filled the large hall at the Alexandra Palace on Thursday, May 4th, on the occasion of the third annual concert. The Military Band of the Tramway Co., under Bandmaster W. A. Cock, is always a credit to the company, and with organ recitals by Mr. C. D. Cunningham and an excellent selection of artistes, a most enjoyable evening was spent.

Late Legal.—PURCHASE OF AN ELECTRIC TRAMWAY.—Mr. Justice Bray, in the King's Bench Division on Wednesday, dealt with a special case stated by the Arbitrators in a dispute between the Hartlepool Electric Tramways Co. and Messrs. Sellon and Ashby, as the statutory promoters of the undertaking, and the Hartlepool Corporation. The matter in dispute was as to the acquisition by the Corporation of certain tramway routes in West Hartlepool, and the question for the opinion of the Court was whether the Arbitrator had jurisdiction to make on award. If the Court should find in the affirmative, the Arbitrators assessed the amount payable in respect of the undertaking by the Corporation at £12,096.

Mr. McCardie, appearing for the Corporation, said that the position of his clients was that they did not want to pay on an award which purported to make them liable to people who had no right to the money. If the Corporation were to pay the £12,000, the Local Government Board auditor might surcharge them with the amount.

His Lordship, in reply to an argument as to who would be entitled to receive the money, said that the proper thing was for the Arbitrator to make his award, which the parties should agree to be without prejudice to all questions, and then the questions ought to be tried by action for specific performance.

Mr. Atherley Jones, K.C., for the company and the promoters, said that the proceedings were purely dilatory.

Mr. McCardie said that all defences, particularly good ones, were dilatory.

His Lordship said that the only question which seemed to arise out of the special case was whether the arbitrators had jurisdiction, and the parties should agree to accept the award without prejudice to the jurisdiction. He could not, unless both sides agreed, try anything which was not within the four corners of the special case.

Mr. McCardie said that so far as the Corporation was concerned, he accepted the suggestion of his Lordship. He was willing to accept the £12,000 as representing the value of that which was claimed by the parties.

His Lordship said that that was most fair to the other side.

Mr. Atherley Jones said that the substantial point, and, in fact, the only point, was whether there was anybody to whom the money could be paid by reason of the non-compliance of the promoters of the company.

His Lordship said that that was not a point raised by the special case, and he could not decide it without consent.

Mr. Atherley Jones argued that at the arbitration proceedings, the point had been taken that the arbitrators had no jurisdiction, on the ground that neither Sellon and Ashby, nor the tramway company, had any interest in the concern.

His Lordship said that if he had to decide the case he would say frankly that he would have to find that the arbitrators could not make the award.

After some further discussion, it was agreed that the matter should be set down as an action without pleading to be tried before his Lordship on June 13th.

An Unusual Cable Breakdown.—Damage to cable by frost is fortunately rare in this country, but two cases occurred at Ruabon, North Wales, and a third in a neighbouring centre, during a severe frost at the beginning of February.

The breakdowns at Ruabon were in 15-pair and 50-pair dry-core lead-covered cable, 10-lb. conductors, laid in gas pipes fixed to the faces of two railway bridges, the continuation cables at each side of the bridges being overhead. Water had entered both pipes by draining down the cables and through the caulkings, which were not sufficiently weatherproof. The water in each case lay in a part of the pipe which was exposed, and during one night's severe frost froze, and, of course, in freezing expanded and compressed the cable almost flat, short-circuiting practically every pair in each cable, and causing many contacts between adjacent pairs.

The faults caused, practically cut off four exchanges and a number of subscribers. The positions of the faults were located by the usual loop test, and, proving to be in the pipes, the faulty sections were cut out by running temporary cables over the bridges and cutting out faulty portions. Afterwards the cables were permanently repaired and the temporary cables cut out.

To prevent future trouble, the tops of the pipes were capped over with lead soldered to the cable, while the lower parts of the pipes were drilled with a few holes to allow of drainage. In the light of the above breakdown these precautions seem very necessary generally wherever pipes are at all exposed.

In connection with the use of the loop test for locating faults, my experience is that it is more satisfactory, where possible, to obtain the end-to-end resistance of the wire under test, divide it by its length (say) in yards, and use that figure per yard in preference to standard figures given in tables. In the present case one faulty part was located within a foot by this method.—J. B. SALMON. *National Telephone Journal.*

Appointments Vacant.—Superintendent for the Mains Department of the Yorkshire Electric Power Co. (£250). Shift engineer, for the Close Power Station of the Newcastle and District Electric Lighting Co., Ltd. (50s.). Teacher for Final Degree Mathematics (Friday evenings) and teacher for Technical Mathematics (Tuesday and Wednesday evenings), for the Tottenham Polytechnic (10s. per lesson). Shift engineer, for the Corporation Electricity Committee, Manchester (£175). Installation engineer and canvasser for the Tynemouth Corporation Electricity Works (£100 and commission). See our advertisement pages in this issue.

Smoke Abatement—A Manchester Exhibition.—A meeting was held in the Midland Hotel, Manchester, on April 28th, of the supporters of the Smoke Abatement Exhibition which is to be held in Manchester in November next. Alderman Fildes, chairman of the Manchester Corporation Sanitary Committee, presided. Councillor Kendall, hon. sec. of the Manchester and District Smoke Abatement Society, who are the organisers of the Exhibition, explained that the Society was formed as the result of a conversation which took place at the successful Smoke Abatement Exhibition at Glasgow. The meeting was well attended by the patrons of the Exhibition, among whom are the technical heads of the Manchester and Salford Corporations' gas and electricity departments, and several gas and electrical engineers from surrounding towns were also present. A great deal was said in reproach of the city of Manchester for not taking part previously in movements of this description, of which that city stood so greatly in need. Alderman Fildes spoke at some length on the injurious effects of the murky atmosphere of Manchester upon the inhabitants, and pointed out how it was directly responsible for the high death rate. He said the Gas and Electrical Committees of the Corporation could help greatly by encouraging the use of gas and electricity for many purposes where at the present time fuel is used. A resolution approving of the proposed Exhibition was carried unanimously. The Smoke Abatement League of Great Britain will hold their annual meeting and conference in Manchester during the Exhibition. An advisory committee was appointed, consisting of the technical heads of the Manchester and Salford gas, electricity and sanitary departments, and several other professional gentlemen. Arrangements were then made with Mr. Walter Cawood, of the City Exhibition Hall, to undertake the management of this Exhibition on behalf of the Society, and all communications concerning the matter must be addressed to him at 196, Deansgate, Manchester.

Glasgow Technical College.—After nine years' work, the buildings of the Glasgow Technical College have been completed, at a cost, with equipment, of £353,000.

Trade Unions.—The *Times* states that a further prolonged conference of the representatives of the British Steel Smelters' Society, the Iron and Steel Workers of Scotland, and the Amalgamated Society of Cranemen, Boilermen, Firemen and Electrical Workers was held in London last week on the amalgamation of these three trade unions. "A scheme has been agreed upon, which is to be submitted to the executives of the three societies for approval or amendment. Afterwards a ballot of all the members will be taken."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—An interesting ceremony took place on May 6th at the Middlesbrough Corporation Electricity Works. MR. H. E. PAWSON, senior charge engineer, is leaving this month to take up a position abroad, and the staff presented him with a travelling trunk. Mr. H. M. Taylor, borough electrical engineer, in making the presentation, expressed his regret at Mr. Pawson's departure, but wished him every success in his new venture. Mr. J. Shaw, of the engine room staff, and Mr. G. H. Moss, of the outside staff, two of the oldest employés of this department, also added their good wishes.

The Gillingham T.C. has increased the salary of MR. F. T. WOODWARD, of the electricity works staff, from £120 to £150 per annum by £10 a year.

The Burton-on-Trent electricity staff has presented a clock and silver butter dish to MR. T. HALL, electrical engineer, on his marriage. Mr. Hall, who was last November appointed to succeed Mr. P. J. Pringle temporarily, has now had his appointment confirmed at the same salary.

The Highways Committee of the L.C.C. recommend the appointment of MESSRS. W. W. WARREN and R. A. S. DUNCAN as charge shift engineers at Greenwich generating station, at £250, rising by £10 per annum to £300.

MR. CLAUDE R. MARSHALL, late of the Kent Electric Power Co.'s staff, has been appointed, out of 37 applicants, junior assistant to the Grays, Essex, U.D.C. electricity department.

The Sheffield Electricity Committee has approved proposals of the general manager for a rearrangement of the staff as follows:—MR. J. W. BARNES, superintendent of the wiring and fittings department, is to be appointed commercial assistant, and his salary is to be increased from £300 to £350 a year; MR. C. E. R. BIGGIN, assistant superintendent of the wiring and fittings department, is to be appointed superintendent, and his salary to be increased from £200 to £225 a year; MR. F. E. MEREDITH, installation inspector, is to be appointed meter and testing assistant, and his salary increased from £130 to £143; MR. J. B. WILKELEY, chief accountant, is to have his salary increased from £210 to £230 a year. The position of meter superintendent, vacant by resignation, is not to be filled.

Tramway Officials.—MR. R. C. E. GREENE, who has been an assistant in the Wallasey tramways department for several years, has secured an appointment in India, and prior to leaving he was the recipient of a leather gun case, presented by the employés.

General.—The *Electrical Contractor* states that MR. G. HARLAND BOWDEN has been unanimously nominated as president of the Electrical Contractors' Association for a second year. Mr. Bowden has been a very active president during the period of difficult controversy, and he has succeeded in whipping up the interest of contractors in many parts of the country. The nomination is at once a compliment and a responsibility, seeing that the controversy mentioned is not yet done with. But why does the Association hide its light under a bushel? Are its doings of interest to none save readers of its own official journal?

On Saturday last, May 6th, a farewell dinner was given to MR. EVAN PARRY, B.Sc., who is leaving this country to take up an appointment as electrical adviser to the New Zealand Government, in connection with the hydro-electric developments which that Government propose to carry out. The dinner was held at the Balmoral Rooms, Trocadero Restaurant, and between 70 and 80 friends and well-wishers were present, amongst whom were Dr. H. F. Parshall (chairman), Mr. Robert Hammond, Mr. W. M. Mordey, Mr. A. P. Trotter, Mr. Palliser, Mr. Tegetmeier, Mr. James Devonshire, and other influential gentlemen representing every branch of the engineering profession. Letters were received from Sir Joseph Ward, the Prime Minister of New Zealand, and Sir Wm. Hall-Jones, the High Commissioner for the New Zealand Government, expressing their regrets at being unable to be present. Telegrams were received from Mr. Ferranti, Mr. C. H. Merz, Mr. T. O. Callender, and others regretting their unavoidable absence. The toast of the guest of the evening was proposed by Dr. Parshall, who pointed out that Mr. Parry had been closely associated with him for the last 18 years, during which time schemes involving the expenditure of many millions of money had been carried out by them extending as far as California, Mexico and Canada. He deeply felt the severance of a connection which had always been extremely cordial and friendly throughout, and congratulated the New Zealand Government on having secured the services of a man so eminently qualified to carry through the schemes contemplated by them. The toast was supported by Mr. Mordey, Mr. Trotter, Mr. Hammond and Mr. Devonshire, all of whom spoke in eulogistic terms of the guest, after which a presentation was made to Mr. Parry of a handsome silver cup, on which were inscribed the names of the hosts. Mr. Tegetmeier, the chairman of the Auckland Tramways, gave Mr. Parry a hearty welcome to New Zealand, and a most enjoyable evening was terminated by a vote of thanks being passed to the chairman and to Mr. Edward Moss, the organiser of the dinner.

MR. F. W. ROBERTS, manager for the Brighton district of the National Telephone Co., who has been appointed engineer-in-chief to the United River Plate Telephone Co., Buenos Ayres, has been presented by the staff with a gold watch.

MR. BERTRAM KELLY, chief assistant engineer of the Manx Electric Railways, and Miss Daisy Christian, of Ramsey, were married at Christ Church, Dhoon, I.O.M., on the 8th inst.

A Glasgow paper says that the retiral is announced of MR. R. D. BINSTEAD, Controller of Telegraphs, Edinburgh. Mr. Binstead first entered on telegraphic service at Southampton, and in 1893 was transferred to the Central Telegraph Office, London, where he served in various important positions till 1904, when he was promoted to the Controllership of Telegraphs at Edinburgh.

The Royal Institution, at Monday's meeting, elected MR. S. Z. DE FERRANTI a member. Among those nominated as vice-presidents was MR. ALEXANDER SIEMENS, and SIR WM. CROOKES continues as hon. secretary.

MR. W. H. BUTLER has resigned his position of chief engineer to the Electrical Power Storage Co., Ltd., after being connected with the concern for the past 26 years. Any communications to Mr. Butler should, for the present, be addressed to 10, Belsize Park, Hampstead, N.W.

The business of Messrs. Thomson & Ramsay, consulting engineers, is being removed on 15th inst. to 95, Bath Street, Glasgow, where MR. ALEXANDER RAMSAY will practice in his own name. He wants manufacturers' latest catalogues.

MR. C. F. EDWIN (A.C.G.I.) has been appointed chief electrical engineer to the Chilian Navy. Mr. Edwin obtained his diploma in electrical engineering in the Central Technical College in 1904. Since that date he has been with Messrs. Siemens Bros. Dynamo Works, Ltd., having held the position of chief of test house for nearly four years.

Obituary.—MR. ELLIS LEVER.—The death took place at Colwyn Bay on May 2nd of Mr. Ellis Lever, who was in his 79th year. The more matured among our readers will remember that, in 1884, Mr. Lever (of Manchester) offered a prize of £500 for a perfect electric miners' safety lamp, but the adjudicators subsequently had to declare that no lamp submitted to them fulfilled the conditions of perfection laid down by the Miners' Union. In 1887, the year of the Udston mine disaster, the deceased gentleman renewed his offer for the production of a perfect lamp within the late Queen Victoria's Jubilee year.

MR. E. BOULNOIS.—We regret to record the death of Mr. Edmund Boulnois, for many years a director of the Westminster Electric Supply Corporation, Ltd., and other electric supply companies, which occurred on the 7th inst., in his seventy-third year.

CITY NOTES.

Cuba Submarine Telegraph Co., Ltd.

THE meeting of this company was held on Wednesday at the offices, 58, Old Broad Street, E.C.

MR. GEORGE KEITH, in proposing the adoption of the report (p. 725), said he was glad to say that the accounts showed an unusually good result for the half-year, which was generally the slack season. The traffics for the six months compared very favourably with those for the corresponding period of 1909. The improvement which was shown could be attributed to the increased prosperity and more active state of business in Cuba and the West Indies. Cuba suffered more or less every year from storms, which, fortunately for their business, increased the use made of their cables along the south coast of the island. The cyclone last November did enormous damage in the western part of the island. Their cable house at Batabano was entirely wrecked, and the landline communication with Havana was interrupted for several days. Their loss of traffic during that time was, he was glad to say, more than made up by the large increase after the communication had been restored, with the result that October now showed an increase instead of the loss which they anticipated. November compared well with the large increase produced by the hurricane of the preceding November, and altogether the traffic for the whole year showed a very satisfactory increase. The traffic receipts for the half-year showed an increase of £1,876; interest on investments and the deposit at the bank was £96 more, and the gross revenue amounted to £18,351, or £1,975 more than in 1909. On the debit side the London expenses were slightly less; the station expenses were £348 more, due to an additional item for cable repairs which did not occur every year. Altogether the total working expenses amounted to £6,672, or £257 more than in 1909. The result of the half-year's business was a balance of profit of £11,679, out of which £2,000 had been placed to the reserve against depreciation of securities and £2,000 to the general reserve. After providing for the payment of the preference dividend, the directors recommended the payment of the usual dividend at the rate of 6 per cent. per annum on the ordinary shares, free of income-tax, reducing the balance to be carried forward by £122 to £7,275. He thought they might consider the results of the half-year's business as very satisfactory. They had again been able to strengthen the reserve fund for the maintenance of the company's property, and at the same time to increase their reserve against the depreciation of their securities, which he was glad to say had lately somewhat appreciated in value with the improved state of the money market. They were now in a good position to meet the additional expenditure which would be incurred this year in re-establishing duplicate direct communication between Cienfuegos and Santiago, so as to ensure the efficient transmission of the through traffic. A contract had been entered into with Hooper's Telegraph Works for the manufacture, transport and laying of the new cable required between Cienfuegos and Cape Cruz, where it would join the present cable at Santiago, and thus complete the duplication of direct communication between Havana and Santiago. The cable would be laid at the end of this year when the weather conditions were most favourable for successfully carrying out the work.

MR. C. W. PARISH seconded the motion.

Replying to a SHAREHOLDER, the CHAIRMAN said that the length of the new cable would be about 300 miles, and its cost would be a little over £40,000. The expense would be met out of the reserve fund.

The report was then adopted.

Manila Electric Railroad and Lighting Co.

THE directors report that for the year ended December 31st, 1910, the result shows an increase in gross earnings over the previous year of $175,340, or 15·36 per cent., an increase in operating expenses and taxes of $10,588, or 1·76 per cent., and an increase in the net earnings of $164,751, or 30·45 per cent. The apparently abnormal increase in the net earnings is largely due to the strike of 1909, which increased the expenses and reduced the gross earnings of that year. After allowing for this the net earnings still show a satisfactory increase, which it is believed will continue. The interest charges amounted to $275,625, sinking-fund requirements called for $25,889, and $60,000 was set aside from the balance to establish a replacement and renewal fund, leaving an available surplus for the year of $344,356. From this amount the directors declared four quarterly dividends of 1 per cent. each, aggregating $200,000, leaving $144,356 over all disbursements and reserves, which has been transferred to surplus account, an increase over the previous year of $103,332, bringing the total surplus account, with reserves up to December 31st, 1910, to $750,124. The properties continue to be well maintained and are efficiently and economically managed. During the past year $133,675 has been charged to maintenance account, and an additional amount of $60,000 has been appropriated as a replacement and renewal fund. In order to handle the increase in business the directors authorised the purchase of one 2,500-K.V.A. steam turbine and alternator with auxiliaries, which will be installed and should be ready for service by the end of 1911. Great improvement is manifest in the economic development of the islands in the matter of agriculture, industry and commerce. The general tone of trade in Manila is one of increased prosperity. Since the beginning of the current fiscal year the directors have increased the dividend rate from 4 per cent. to 5 per cent. per annum, and have added $31,000 face value of 5 per cent. first lien and collateral trust sinking fund gold bonds to the sinking fund, making the total bonds in that fund $119,000.

West African Telegraph Co., Ltd.—The directors' report for the year ended December 31st, 1910, states that the revenue for the period amounted to £61,797, from which is deducted £15,602 for the ordinary expenses, and £5,321 for expenditure relating to maintenance of cables and income-tax abroad, leaving a balance of £40,874, to which is added £922 brought forward, making a total available balance of £41,796. The sum of £1,319 has been provided for income-tax, £31,000 has been transferred to general reserve fund, and an interim dividend of 2 per cent. (free of income-tax), absorbing £4,622 was paid on December 1st last. The directors recommend a final dividend of 2 per cent. (free of income-tax), on and after May 18th, making, with the interim distribution, 4 per cent. for the year, the balance of £233 being carried forward.

Western Telegraph Co., Ltd.—The directors' report for the half-year ended December 31st, 1910, states that the revenue for the period amounted to £431,967, and the working expenses to £162,753. After providing £16,373 for debenture stock interest, and £7,697 for income-tax, there remains a balance of £245,143 plus £7,513 brought forward, making a total of £252,655. First and second interim dividends, amounting to £62,379, have been paid, and after transferring £150,000 to the general reserve fund, and £10,000 to the land and buildings depreciation fund, there remains £30,276 which is carried forward.

West India and Panama Telegraph Co., Ltd.—The directors' report for the six months ended December 31st, 1910, states that the amount to credit of revenue is £40,306, against £34,679 for the corresponding half-year of 1909, and the expenses have been £24,319, against £23,558. The result is, therefore, a balance of £15,987, to which is added £1,599 interest on investments, and £1,953 brought forward from last account, making an available total of £19,540. The directors propose that this amount be dealt with as follows: First preference shares—dividend, six months to December 31st, 6s. per share, £10,369; second preference shares—dividend, six months to December 31st, 6s. per share, £1,401; ordinary shares—1s. 6d. per share (free of income-tax), £6,624 = £18,394. Balance carried forward, £1,146. The traffic receipts for the six months show an increase of £5,645, as compared with those for the corresponding period. Notice has been received from Mr. Robert Jackson (a shareholder), that, in accordance with the intimation given by him at the last meeting, he will propose the following resolution: "That a sum of £600 be voted to the directors in recognition of their past services to the company."

Great Eastern Telegraph Co., Ltd.—The directors' report for the six months ended December 31st, 1910, states that the revenue for the period amounted to £670,148, from which is deducted £219,231 for the ordinary expenses and £45,558 for expenditure relating to maintenance of cables, sundry differences in exchange and income-tax payable abroad, leaving a balance of £405,358, plus £59,590 brought forward, making a total available balance of £464,949. After providing for income-tax payable in England, interest on mortgage debenture stock and dividends on the preference stock, which in all absorb £81,186, there remains a balance of £383,762, out of which the directors have placed £180,000 to the general reserve fund, and have paid an interim dividend of 1¼ per cent. on the ordinary stock, amounting to £50,000. The directors now recommend the declaration of a final dividend on the ordinary stock of 1¼ per cent. and a bonus of 2 per cent., amounting together to £130,000, both payable on May 17th, free of income-tax, and making, with the three previous payments on account, a total distribution of 7 per cent. for the year 1910. It is proposed to carry forward the balance of £23,762.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The directors' report states that the gross receipts for the half-year to December 31st amounted to £336,976, against £315,034 for the corresponding half-year of 1909. The working expenses, including £22,607 for maintenance of cables, absorb £154,300, against £143,674 for the corresponding period of 1909, leaving a balance of £182,676. From this is deducted £2,355 for income-tax payable in England, £417 for extraordinary expenses, and £15,048 for interest on debenture stock, leaving as the net profit for the half-year £164,854. After adding £72,763 brought forward, there is an available balance of £237,618. The dividends and bonus are as published in our last issue. £75,000 has been transferred to the general reserve fund, and the balance of £27,618 carried forward.

Craigpark Electric Cable Co., Ltd.—The annual meeting of this company was held on the 8th inst., at Glasgow. Mr. W. S. Brown, who presided, stated that the business had increased during the past year, and that they had now put on the market a new type of golf ball, which experts had declared to be satisfactory. The report was adopted.

(*Continued on page 765.*)

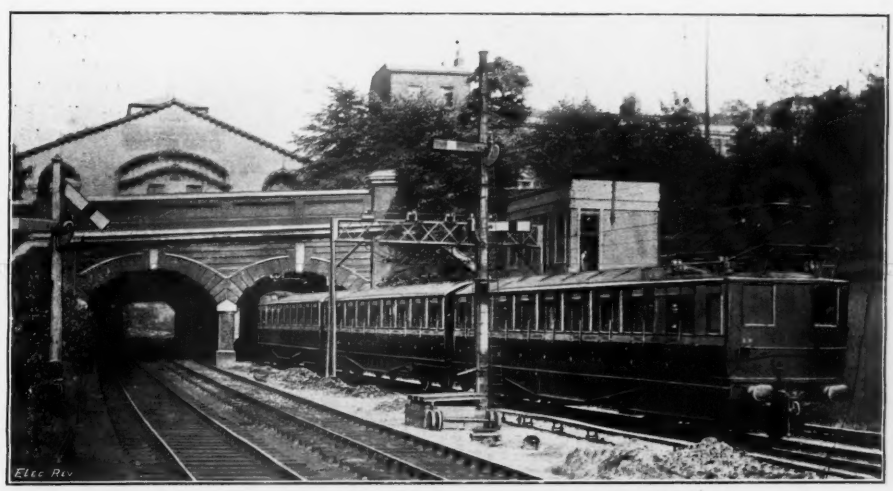
THE BRIGHTON RAILWAY ELECTRIFICATION.

In 1906 the Brighton Co. let the first contract for electrifying what is known as the South London line, which connects the two termini of London Bridge and Victoria, and passes through East Brixton, Denmark Hill, and Peckham Rye.

In considering what system to adopt, one of the important points which could not be overlooked, was that the very heavy traffic already existing between London Bridge and Brighton, rendered it likely that if electrification proved a success on the suburban system, it might afterwards have to be extended as far as Brighton.

It was for this reason that the single-phase system was adopted, and results have fully justified the installation of this system.

Experimental trains were run on the South London line early in 1909, the full electric service being taken up in December of the same year.



Three-Coach Electric Train Passing Denmark Hill Switch Cabin.

The length of the route is 8·7 miles, and this is equivalent to 20½ miles of electrified single line. The average distance between stations is 4,590 ft., whilst the shortest distance between any two stations is 1,386 ft.

But notwithstanding the difficulties, the journey (including 20-second stops at each station), is easily accomplished in 25 minutes. Five platforms are electrically equipped at Victoria, whilst there are six platforms equipped at London Bridge.

Overhead Work, Entrance to London Bridge Station.

The success of the first experiment has been so great, that in May of last year it was decided to extend the electrification, the new sections being those portions between Peckham Rye and West Norwood, and between Victoria, West Norwood, the Crystal Palace and Selhurst, thus bringing up the total amount of single track electrified to 62 miles.

The rolling stock on the South London line consists of 16 motor coaches, each equipped with four motors which will give an output of 115 H.P. for one hour, and 57 H.P. continuously with a temperature rise of any part not exceeding 75° C.

In the middle of the day the trains are made up of two coaches, one motor and one trailer; whilst in the morning and the evening, two such trains are run coupled together.

The rolling stock for the extensions consist of 30 motor coaches, each equipped with four motors capable of giving 175 H.P. for one hour, and 100 H.P. continuously, during the hours of lighter traffic. One of these motor coaches will deal with two trailer coaches, thus making up a three-car train, whilst in the morning and afternoon six-car trains will be run.

Side doors in the compartments have been used for all the stock, as the end-door type would not have enabled the carriages to be filled and emptied sufficiently quickly at the termini, and the experience of the former stock has been entirely satisfactory.

Electrical energy for running the trains is purchased from the London Electric Supply Corporation's power station at Deptford, and is delivered to the railway company at Queen's Road and at Peckham Rye Junction, where it is metered.

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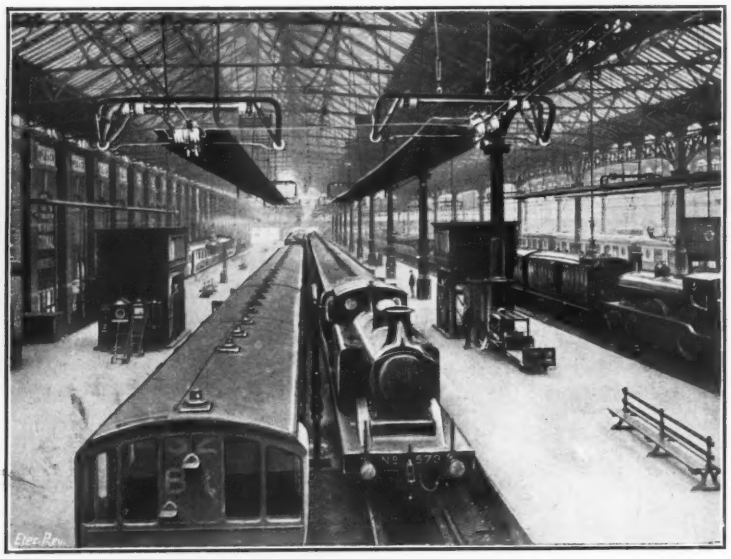
In consequence of the Board of Trade limiting the drop in potential in the return circuit, series booster transformers are located at various points along the line and are connected by booster cables to the distributing cabin at Peckham Rye.

Besides this a so-called distributing cable is run the whole length of the electrical line, the "inner" being in parallel with the overhead conductors and connected to them at each switch cabin, whilst the "outer" is bonded to the rails. Besides these cables, a series of telephone wires are run along the line, connecting the various switch cabins.



Overhead Construction, Victoria Station, showing Clearance over Steam Trains.

Great care has been devoted to the design of the overhead construction and the result of 18 months' practical working has been entirely satisfactory.

The construction adopted is of the double catenary type, the contact wire being suspended by clips every 10 ft. The contact wire itself is of copper, round in section, but with two sharp grooves on either side, to which the clips supporting the wire are fixed. The whole insulation is of porcelain, and a special form of insulator has been used which has given every satisfaction. The choice of this particular size and type of insulator was the result of a large number of carefully conducted and practical tests extending over nearly 12 months.

No tightening device is used for the conductor wires, and experience has shown that in the case of the English climate, at any rate, such devices are entirely unnecessary.

The bow collectors on the trains are of special design, as they have to operate at varying heights, there being a difference of 6 ft. between the highest and lowest working position. The collectors are fitted with aluminium strips having a deep groove filled with grease, and have given excellent results. All the wear is practically taken by these, the wear on the copper contact wires, after nearly 18 months' running, being inappreciable.

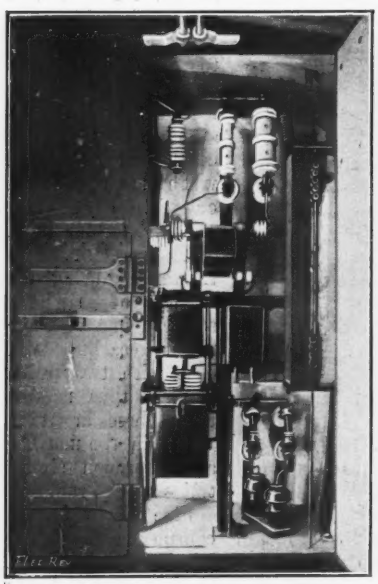
For the South London line, car-sheds and repair shops were erected near Peckham Rye, where the electric trains are inspected, and overhauling and maintenance is carried out. The shops are supplied with electric cranes and capstans which greatly facilitate operations.

Fears have been expressed in the past that any overhead line would greatly interfere with the drivers' view of the signals, but experience has not shown this to be the case.

The normal line pressure on the contact wire is 6,700 volts, and the periodicity 25 cycles per second. The energy consumption has been most satisfactory, and compares more than favourably with what has been done on continuous current lines.

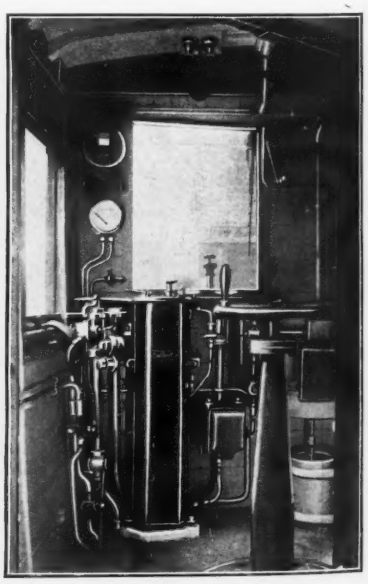
The acceleration obtained is also satisfactory, being equal to that obtained on most of the continuous-current railways in Great Britain. The average acceleration from 0 to 30 miles an hour is at the rate of 1 mile per hour per second. The energy consumption per ton-mile, in which nothing is included for weight of passengers, and with no mileage allowed for empty running or shunting, and including all the energy used for the repair shops and leakages from all sources, for the first eight months of 1910, metered at Queen's Road, amounted to 75·4 watt-hours per ton-mile. This, notwithstanding the fact that all trains are stopping trains, and that therefore the line works under unfavourable conditions when compared with other railways having a certain number of non-stopping fast trains.

The total weight of a four-car train empty is 150 tons, and of this the electrical equipment, including all cables for lighting, lighting fixtures, motor compressor, and all electric gear, boosters, &c., amounts to 18 tons in the case of the



High-tension chamber on motor-coach.

Wiring under car floor.



Motor-man's compartment.

Detail Views, Single-phase Railway Coaches.

South London line. In the case of the new Crystal Palace extensions the weight of a three-car train is 102 tons, and the weight of the same equipments on the same basis as above is 19 tons. The energy consumption on the trains during trial running on the South London line was 63·1 watt-hours per ton-mile measured on the train.

In consequence of the adoption of the single-phase system, the transmission losses between the distributing room at Peckham Rye and the trains are very low. All the losses from the distributing room where the supply is metered, up to the trains, amount to about 3 per cent.

The financial results have been very satisfactory; the railway company lost, on the South London line alone, in a very few years, in consequence of tramway competition, over 5,000,000 passengers. Although very little alteration was made to the fares, the whole of the traffic was got back practically within the first 12 months, and the traffic is increasing daily.

The whole of the electrical work was designed and carried out under the supervision of Mr. Philip Dawson, the company's consulting electrical engineer.

The contractors for the whole equipment, excluding coaches, were the A.E.G., of Berlin, the coaches being constructed by the Metropolitan Amalgamated Carriage and Waggon Co., of Saltley, Birmingham. The sub-contractors for the whole of the overhead line work, including feeders, switch cabins, &c., were Messrs. R. W. Blackwell & Co., Ltd., who, in their turn, sub-contracted with the British Thomson-Houston Co. for the switch gear, and with Messrs. Siemens Bros. and Messrs. Johnson & Phillips for the cables required.

The cranes and capstans were supplied by Messrs. Stothert & Pitt. The principal contractors for the extensions now nearing completion are the same.

The repair shops and carriage sheds at Peckham Rye, as well as the switch cabin buildings and the new carriage sheds for the electrical stock at Norwood Junction, were designed and carried out under the supervision of Mr. Charles F. Morgan, the chief engineer of the Brighton Co.

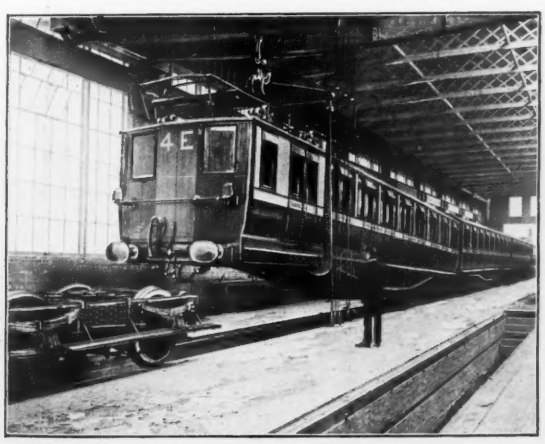
OFF-PEAK LOADS FOR CENTRAL STATIONS.

Only too many stations know what it is to operate with a peak load 50 per cent. or more above the average daily load, with the result that much of the machinery, on which the capital charges continuously accrue is only earning intermittently. It is obvious

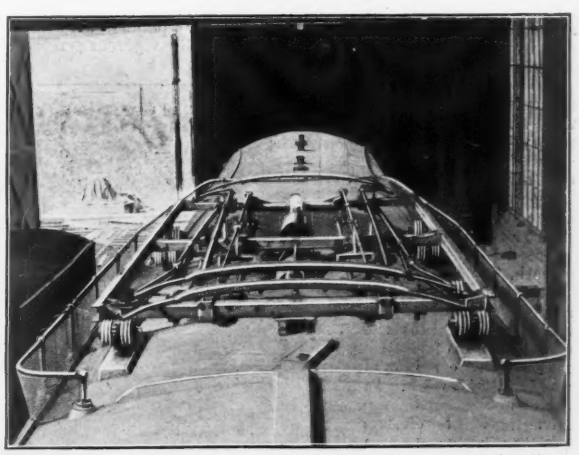
Plan showing the Brighton Co.'s Electrified Suburban Routes (London Bridge-Victoria-Crystal Palace).

that in any such case the most profitable extension of business will be the securing of off-peak loads.

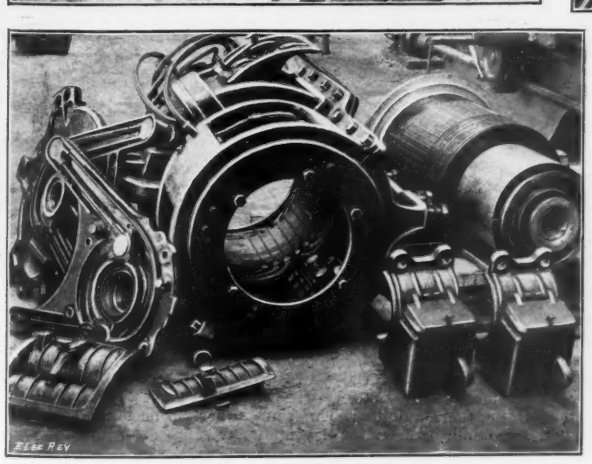
Though lighting is the most general domestic application of electrical energy, there are many other services to which the latter may be applied, the exact nature of these applications depending



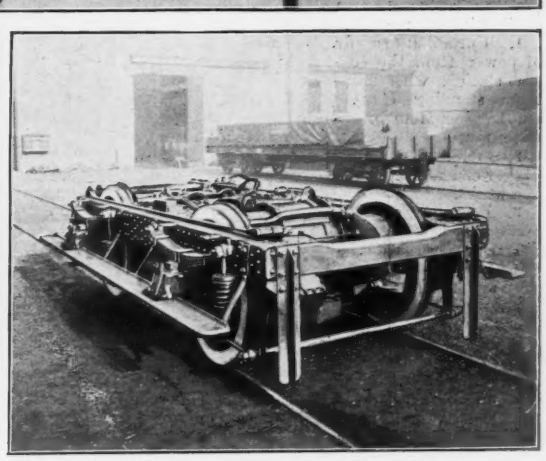
Coach lifting device; repair shops.



Collecting bow lowered.



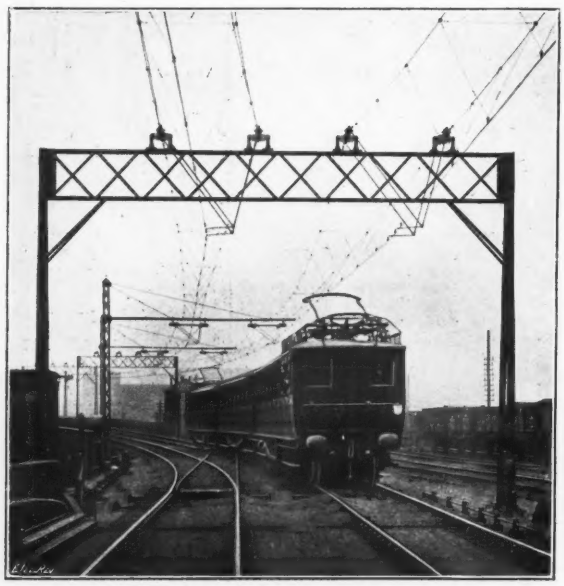
Railway motor, &c., dismantled.



Standard motor bogie.

Detail Views, Single-phase Railway Coaches.

largely upon the class of consumer concerned as well as upon such local conditions as climate, prevailing industries, and so on. Among these, many off-peak loads can be secured, the first step in the campaign being to educate the public to a knowledge of the convenience, utility and economy of electric power in all manner of miscellaneous applications. The aim of all publicity methods should be to make *every* class of person inquire whether electricity cannot be advantageously applied in his home or business. Publicity campaigns should be general rather that particular in their attack, and they should, above all, never sink into a stereotyped form. The general public should be approached through serial advertisements—covering as many phases of electricity utilisation as possible—in *newspapers*. Technical journal advertisements, being mainly read by a different class of person, have a different aim, and should be differently framed. Good publicity, by mail and by advertisement, must be followed up by vigorous personal canvassing, mistaken ideas as to the unholy monopoly possessed by the station and the money-seeking propensities of the latter being carefully removed from prospective consumers. Once the canvasser secures an interview, his road is comparatively smooth.



Train on South London Electric Railway (page 763).

One of the largest sources of demand for off-peak current is the extended use of electric motors in commercial and industrial work. In such applications, the advantages of electric motors over steam engines include:—

1. Unlimited supply of power from the central station, with minimum standing charges and freedom from breakdown risks.
2. Increased efficiency of power transmission in the works.
3. Economy of floor space; ease of control and wide speed range.
4. Absence of noise and dirt, and reduced risk of accidents.

In extending the use of all electrical appliances, manufacturers and central stations should closely co-operate, but the central station should only seek to advance the best goods, since by no other means can a permanently satisfied client be ensured. The booming of an inferior article, because it is specially cheap, or, worse still, because it has a heavy current consumption, is suicidal policy.

Many of the more expensive electrical appliances (*e.g.*, electric vehicles, refrigerators, washing machines and vacuum cleaners) are most suitable—at least in the first instance—for adoption by comparatively wealthy clients. In approaching the latter, almost-personal correspondence advertisement must be adopted, and great care must be bestowed upon the tone and wording selected. Such consumers, once gained, are valuable, not only in themselves, but indirectly by their example and testimony to the value of electrical appliances in general.

The electric vehicle is rapidly growing in popularity (particularly in America),* and the charging of their batteries offers many advantages as a central station load. In the first place, such charging is usually carried on during the night—distinctly an off-the-peak period. Again, large amounts of energy are required by each vehicle (a 5-ton delivery van consuming 35 to 40 units a day—*i.e.*, about twice as much as an average family uses for lighting in a month). This is of obvious advantage in itself, and has a further advantage in the small amount of clerical labour involved per £1 of revenue from such sources.

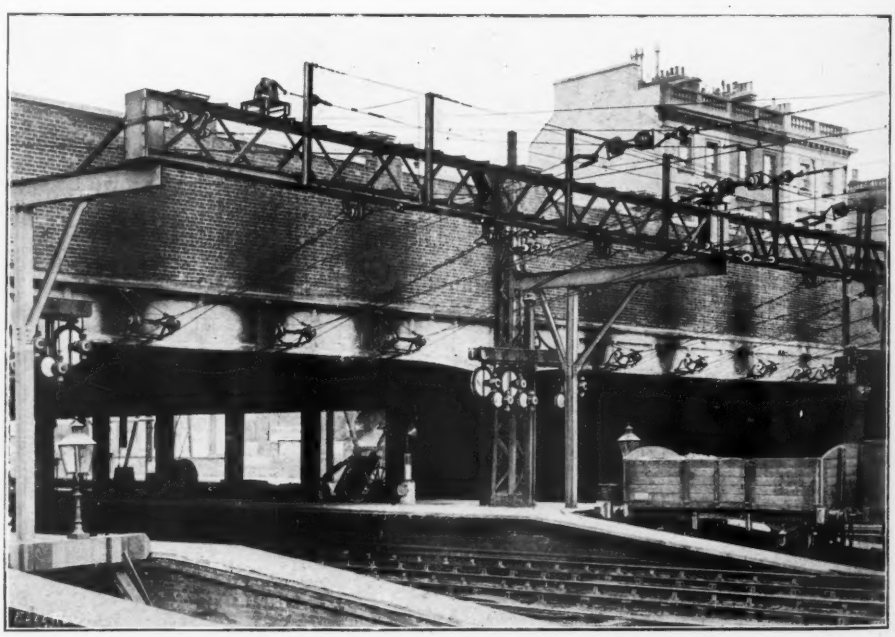
The electrical operation of refrigerators, particularly if regulated with due regard to the load-time curve of the supply station, so as to secure favourable tariffs, can easily compete with any of the older methods, as regards low working costs.

Electrically-driven washing machines, vacuum cleaners, and so on, are of great hygienic and social importance, besides forming valuable loads to central stations. To quote the naive, yet very apt words of Mr. Tenney:—"There are a multitude of them (labour saving devices), all adding to the comforts of civilisation as well as to the off-peak load of the stations supplying the current."

Apart from the above all-the-year-round loads, central stations have much to hope for from the bulk supply of isolated industrial plants during the summer months. Such installations commonly employ their exhaust steam for heating purposes during the winter, thus securing a very low overall coal bill in this period. During the summer, however, there is no application for the exhaust steam, and it is then to the manufacturers' advantage to accept bulk electrical supply from a central station. This arraugement, while relieving the isolated plant of a disproportionately high coal bill during the summer, admirably accords with the desire of the central station for increased off-peak loads over this period.—(Abstract from *Southern Electrician*, April, 1911.—E. H. Tenney.)

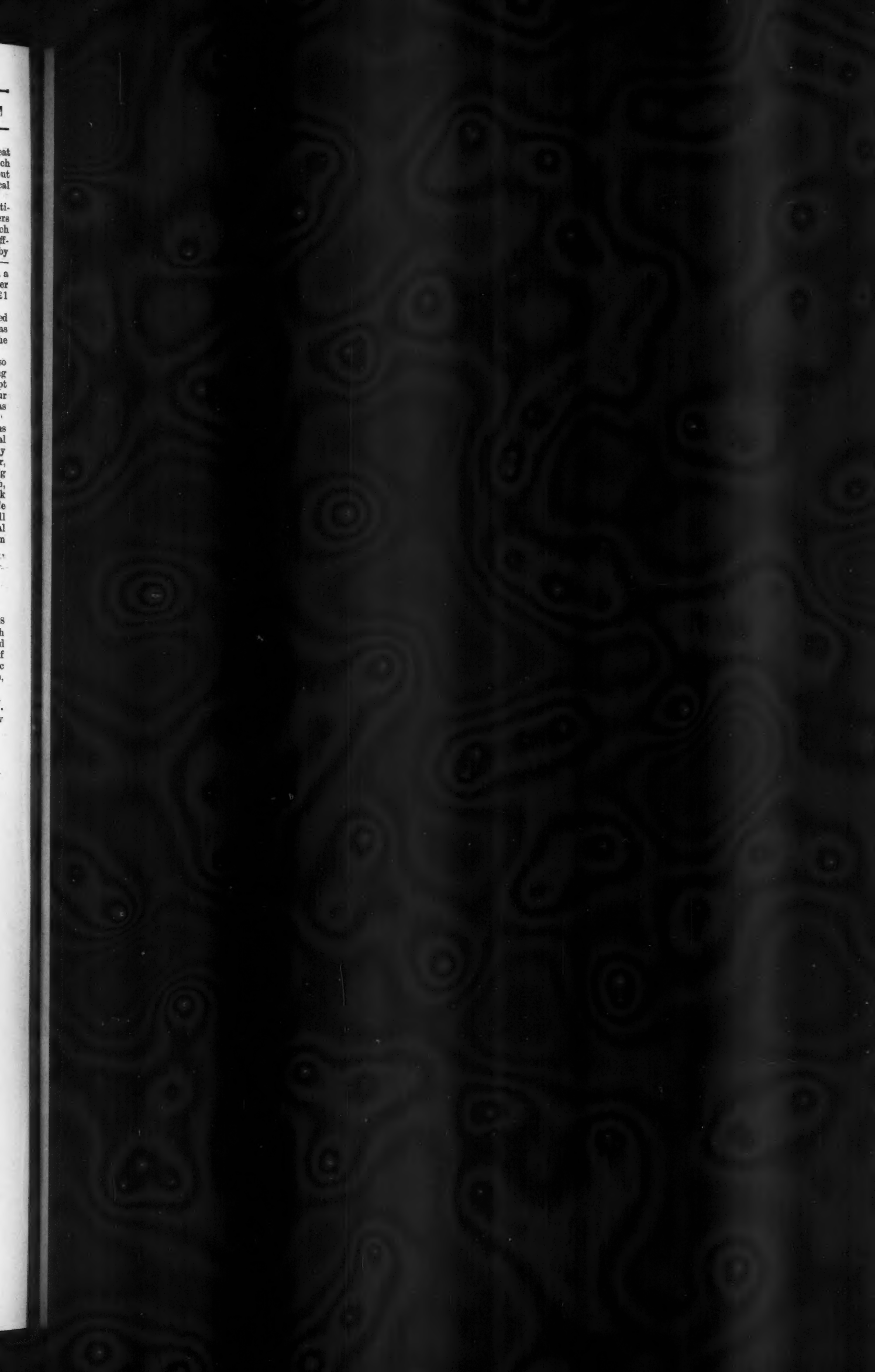
Electrical Fatality.—A South African paper contains a report from Johannesburg to the effect that on April 11th William Montgomery, a fitter employed on the Bantjes Consolidated Mine, making connections and taking measurements near the roof of the central engine-house, came in contact with a live electric wire and received a fatal shock. Deceased was a married man, 34 years of age, and was a native of Scotland.

Olympia Exhibition (1905) Trust Fund.—Mr. W. Davenport, the manager, informs us that the above fund has now been realised, and the sum of £379 has been paid into the funds of the Electrical Trades Benevolent Institution, and £204 to the Benevolent Fund of the Institution of Electrical Engineers. The trustees for this fund were:—Sir Wm. H. Preece, K.C.B., E. Cunliffe-Owen, C.M.G., John E. Kingsbury, Chas. Spencer Northcote, Jas. E. Edgcumbe, and Walter Davenport.



Single-phase Overhead Work at Low Bridge, Entrance to Victoria Terminus (page 763).

* Thus, recent statistics show that in Boston, U.S.A., one out of every 26 motor vehicles is electrically operated, while in Cleveland this ratio rises to *1 in 4*.



CITY NOTES.

(*Continued from page 760.*)

Shanghai Electric Construction Co., Ltd.

THE directors' report for the year ended December 31st, 1910 states that the accounts show a profit of £7,584, as compared with a loss to December 31st, 1909, of £949. There remains a balance of £6,635, which it is proposed to carry forward.

A comparison of the accounts now submitted with those relating to the preceding 18 months shows that substantial progress has been made in the number of passengers carried, the traffic receipts per car-mile, the gross earnings, and the net operating receipts. This improvement has been obtained as the result of a policy of popularising the trams by means of extremely low fares. While the average fare per passenger in 1909 was slightly in excess of three-farthings per passenger, the average in 1910 was less than two-thirds of a penny. The loss by exchange on subsidiary coinage, which showed an almost continuous growth throughout 1908 and 1909, has been nearly stationary at about 25 per cent. throughout 1910, resulting in a loss of £13,579 under this head for the year, equivalent to nearly 4½ per cent. on the capital of the company. No permanent improvement in this direction is likely to occur until Chinese currency has been placed on a sound basis. The introduction of the six trailer cars, referred to in last year's report, gave satisfactory results, and, at the date of the accounts, 10 trailers were in use. Two more have since been put into commission, and the board has authorised the construction of a further 18, which will be brought into use as required. The carrying capacity of trailers, and the low cost at which they can be operated, indicate that it is by their means that the development of the business can be best attained. Negotiations for the initiation of through running over a portion of the lines of the French Tramway Co. in Shanghai are not yet concluded. The annual meeting of ratepayers, held on March 31st last, agreed to relieve the company from the cost of road maintenance for the future.

The annual meeting was held on Thursday last week at the offices, Basildon House, Moorgate Street, E.C. Sir Alfred Dent, K.C.M.G., presided, and, in moving the adoption of the above report, said that in comparing the accounts for the 12 months with those presented on May 26th last, they had to compare 12 months with the 18 months' account of 1909. The present year showed a profit of £7,584, which, after deducting the loss of the previous account of £949, left them with a balance of £6,635, which they proposed should be carried forward in preference to applying it at present for depreciation or other purposes. It was some satisfaction to find that they were at last making a profit. He could but regret it was insufficient to enable them to suggest any dividend to the shareholders at present. There was, however, every indication of a considerable improvement in net receipts during the present year, notwithstanding the plague scare and the monetary crisis. The gross traffic receipts (at a face value of coinage) amounted to £61,362, as compared with £48,792 for the previous year. The effective receipts (after deducting loss by exchange of depreciated subsidiary coinage) amounted to £48,365 as compared with £39,719 ior the previous year, thus showing a comparative increase of £8,646. The loss by exchange of subsidiary coinage into Mexican dollars amounted to £13,578, which was equal to 24·91 per cent. of the gross cash collected on the cars as compared with 24·01 per cent. during 1909, and representing the equivalent of about 4¼ per cent. on the capital of the company. During the past year £8,290 was expended on capital account, mainly in providing additional trailer cars and additional land for a second car-shed in the Eastern district, which they had paid for themselves instead of arranging for a lease as contemplated a year ago. This second car-shed had become necessary, owing to the trailers, and would save the dead mileage incurred in housing all the cars at night at Bubbling Well. The changes in sections and fares referred to in the last report was introduced on May 29th, 1910, and as a result of those changes the following seven months showed average monthly increases of 33 per cent. in passengers, and 12 per cent. in effective receipts over the monthly figures for the preceding five months. The council had lately sanctioned further changes in sections and fares, designed to make full use of the additional rolling stock which was being provided. New trailer-cars constructed locally were gradually being put into service, and altogether 30 of these cars would be put into operation during this summer. The traffic and other receipts for 1910 worked out at 5·81d. per car-mile, as against 4·81d. for 1909. Traffic expenses in 1910 amounted to £9,040, as against £8,683. General expenses amounted to £6,460, as against £6,468; repairs and maintenance were £9,685, as against £7,808; power expenses (the saving being less than at one time anticipated), amounted to £10,246, as against £10,652; the royalty on gross receipts amounted to £2,389, against £1,931; the total expenses being £37,820 for 1910, and £35,542 for 1909. Their expenses worked out at 4·54d., as against 4·31d., and the working profit was £10,541, or 1·26d. per car-mile against £4,176, or ·50d. per car-mile in 1909. The expense ratio for 1910, which had lately been further reduced, was 78·2 per cent., against 89·48 per cent. The car-miles run amount to 1,996,368, against 1,979,001, and the passengers carried numbered 18,715,215, against 11,772,715. In working out these figures they had compared the 12 months to December 31st, 1910, with the figures for the same period in 1909. While the car-mileage had been stationary, the number of passengers had increased over 50 per cent., but this was mainly due to shorter fare sections and low fares. Each ticket for however short a distance was counted as a passenger; on previous occasions he had explained that their chief trouble was the depreciation in the Chinese copper currency, which did not exist at the time the concession was granted. The matter of currency had lately been seriously taken up by China in accord with some of the European Powers and America, the result of which was the important Decree from Peking on May 24th last, fixing the unit of currency as a dollar of 7 mace 2 candareens, with subsidiary decimal coins down to one-tenth of a cent, and ordering that all mints should cease coining except the Central Mint of Tientsin. The want of money had been the difficulty hitherto in carrying out this Decree, but it was hoped the loan of £10,000,000 now announced would provide the necessary funds, as it was said that 60 per cent. thereof would be apportioned for that purpose. As the old copper coins were to be gradually redeemed and a date fixed at which they would cease to be legal tender, there was some real chance of an improvement in the currency in the future, but he was afraid China was likely to move slowly in the matter. The necessity for tramways to assist in solving the traffic problem in Shanghai had been proved on many occasions, and Colonel Bruce, the captain superintendent of the police, in his 1910 report, had again called attention to the pressing importance of obtaining further facilities in that direction. They would remember that the Council last year consented to relieve the company of road maintenance and to a suspension of the royalty, and presented their Budget with those items omitted. The ratepayers refused to approve this, and the amounts subsequently appeared as supplementary credit of taels 17,800 for royalty and taels 7,000 for road maintenance in the treasurer's amended estimate of revenue for 1910. He was glad to report that at this year's meeting, though the council made no recommendation themselves, they supported an amendment to the 1911 estimates, which was put forward by the local director of the company, Mr. L. J. Cubitt, to strike out the amount for road maintenance in the future, and this was agreed to. In conclusion, the Chairman said that it was regretted by some of their friends in Shanghai that the company was not a local one. As to that, he thought it was practically certain that the whole of the original capital would never have been subscribed in Shanghai, and it was equally probable that only a small portion of any further capital that might hereafter be found necessary could be raised on that side either in the form of debentures or shares. In his opinion it would be a serious mistake to alter their present constitution until the company became independent of outside finance and of a London board of some kind. Before headquarters could be moved to Shanghai, it would be necessary to pay off the loan to the London bankers which stood at £31,500. The board had also been criticised at a meeting of the ratepayers for not purchasing the municipal electric works. As a matter of fact, they had made several attempts to purchase, the last being in March, 1908, when they authorised their representative in Shanghai to make what they thought a very liberal offer for the purchase of the undertaking, but the negotiations fell through.

MR. J. S. HASKELL seconded the motion.

SIR LINDSAY LINDSAY-HOGG, MR. WALTER and other shareholders spoke as to the desirability of removing the headquarters of the company to Shanghai in order to save expense and please the local people.

The CHAIRMAN, in reply, said that at present there was not more than 9 per cent. of the capital held in Shanghai, and he thought the English shareholders would be wise to keep in touch with London.

The report was then adopted.

City Electric Light Co., Ltd. (Brisbane).

THE directors, in their report for the half-year ended January 31st, 1911, state that the results of working have been such that the usual sums have been placed to the credit of the reserve fund, dividend equalisation fund, franchise purchase sinking fund and the accident insurance account; and substantial sums to the credit of the renewal, replacement and contingencies account. After making these provisions there remains a credit balance of £5,342 which, with the balance brought forward, makes £7,177 to be disposed of. They recommend that, on March 14th next, dividends be paid at the rate of 6 per cent. per annum on the preference shares, at the rate of 10 per cent. per annum on the fully-paid ordinary shares, and at the rate of 10 per cent. per annum on the contributing shares. They also recommend the payment on the same date of a bonus at the rate of 2½ per cent. per annum on the fully-paid ordinary shares and at the rate of 2½ per cent. per annum on the contributing shares. The payment of the above-mentioned dividend and bonus together with the dividend duty, will absorb £4,998, leaving a balance of £2,179 to be carried forward. The directors again draw attention to the good work of the staff, which has greatly contributed to the excellent results achieved. It was anticipated that the new waterside power house in William Street would be in active operation by now. "Owing, however, to non-arrival of the plant, which should have been delivered in October last, the operations have been delayed, but, as one of the turbo-generators is now on the Australian coast and the foundations are already completed, it is anticipated that electricity will be supplied from William Street during the next few months."

Prospectus.—*The Cascade Water, Power and Light Co., Ltd.*—There have been offered this week $285,500 first mortgage 4½ per cent. bonds of $500 each, at £90 per $500 bond, the principal, interest and sinking fund being guaranteed by the West Kootenay Power and Light Co., Ltd. The list closed on Wednesday.

German Electrical Companies.

The Ost Europaische Telegraphen Gesellschaft, of Cologne, which owns a cable between Constanza and Constantinople, realised total receipts amounting to £11,200 in 1910, as compared with £11,100 in the preceding year. After meeting working expenses and providing for depreciation, cable renewals and maintenance, &c., there remain net profits of £4,500 as against £4,800 in 1909, on a share capital of £50,000. The method of disposing of the profits is not stated, although a rate of 6 per cent. was paid for 1909.

The report for 1910 of the Deutsch-Sudamerikanische Telegraphen Gesellschaft, of Cologne, refers to the completion, as announced in a previous issue, of the final section of the cable, thus establishing connection between Emden, Borkum, Teneriffe, Monrovia, and Pernambuco. The connection in the English Channel was repeatedly interrupted during the year, and in every case the interruption was to be attributed to fishing steamers which seized and damaged the cable with their trawling appliances. Measures were, therefore, taken into consideration to secure the cable from future damage on a length of about 50 nautical miles which was the most in danger. The accounts show gross profits, including the balance forward, of £106,000, as compared with £23,000 in the previous year. After meeting general expenses, cable maintenance, and renewal reserve fund and depreciation and interest charges on the 4½ per cent. bonds amounting to £855,000, the net profits are returned at £43,800, as contrasted with £9,400 in 1909. It is proposed to pay a dividend at the rate of 6 per cent. for the whole of the past year, this distribution contrasting with the same rate which was paid for four months in 1909.

The Electrical Trustee Bank (Treuhandsbank fur Elektrische Industrie), of Berlin, will perhaps be remembered as having been formed in 1909 under the auspices of the Felten & Guilleaume-Lahmeyer Works, part of whose interests have been transferred to the A.E.G., including, apparently, those of the bank. According to the latter's accounts for 1910, the net profits amounted to £12,500, as against £11,300 in the previous year, the total receipts being derived from interest. It is stated that the A.E.G. seems to let the bank continue to exist for those transactions which the A.E.G. does not carry out in common with the Siemens-Schuckert Works through the agency of the other electrical banks, the Elektro Treuhand Aktien Gesellschaft.

The shareholders in the Voigt & Haeffner Co., of Frankfort-on-Main, approved at the recent meeting the payment of a dividend of 10 per cent. on the share capital of £150,000 for 1910, being the same rate as in the preceding year. After appropriating £11,000 for depreciation, the accounts showed net profits and balance forward of £30,800, as compared with £27,400 in 1909. According to the directors' report, the improvement in the course of business continued during 1910, particularly in the second half of the year. An increasing capacity of consumption was exhibited in general, both in the home and export markets, the only exceptions being certain branches which are being more and more withdrawn from the special electrical works and installation contractors owing to the monopolistic endeavours of some large firms. The export trade had to suffer from the high import duties, and the tendency everywhere perceived of increasing the native production. It was mentioned that business continued brisk in the present year.

The report for 1910 of the Duisburg Cable Works Co. (Kabelwerk Duisburg) states that there was an increased turnover and fairly regular employment. A fire which occurred in October destroyed the insulating tube factory and a portion of the insulated wire factory, the cable and other departments remaining undamaged. An adjoining site had been acquired where new buildings would be erected and an extension of the works carried out. The compensation received from the fire insurance offices was devoted to depreciation, and the total provision made for this purpose was £44,200, as contrasted with £11,800 in 1909. As net profits the accounts show the sum of £9,600 for 1910, as against £8,700 in the previous year, and a dividend of 10 per cent. is to be paid on the share capital of £75,000, being the same rate as in 1909. It is intended to increase the share capital to £112,500 by the issue of new shares of £37,500, for the purpose of defraying the cost of the extension of the works.

The directors of the Deutsche Kabelwerke have made provision in the accounts for 1910 for depreciation to the same extent as in the preceding year, and the low valuation of the stocks of materials is declared to represent a considerable reserve. The net profits reached £19,800, as against £17,800 in 1909, and it is proposed to pay a dividend of 8 per cent. for 1910, as contrasted with 7 per cent. in the previous year. A further increase in the turnover is reported for the current year both in the case of the company and in that of its subsidiary undertakings, so that favourable results are expected on the larger amount of share capital entitled to dividend for the present year.

The Insulated Wire Works (Fabrik Isolirter Drahte vorm. C. J. Vogel) Co., of Berlin, which recently declared a dividend of 7 per cent. on the share capital of £67,500 for 1909-10, as against 2 per cent. in the previous year, reported that the improved results were due to the greater turnover and the advantageous working of new machinery. After apportioning £3,900 to depreciation as against £3,700 in 1908-9, the net profits amounted to £6,000, as compared with £2,000 in the preceding year. A scheme is now under consideration for increasing the share capital to £175,000 by the issue of new shares of £107,500, which are to be almost wholly exchanged for shares of the Ariadne Insulated Wire Works, of Charlottenburg. It is announced that, nowithstanding this projected community of interests, the two undertakings will not be completely amalgamated, although Prof. Aron, who is the chief proprietor of the Ariadne Works, will become a director of the Vogel company on the completion of the transaction.

The C. Lorenz Aktien Gesellschaft, of Berlin, which is engaged in telephone and telegraph work, reports that the volume of business was greater in 1910 than in the previous year, although all departments were not fully employed in consequence of the decline in the orders received from the railway and postal authorities. It was, therefore, necessary to counteract this deficiency by increased activity in other departments. The sales prices also left something to be desired. After making provision for depreciation to the amount of £11,300, as compared with £10,800 in 1909, the accounts exhibit a net profit of £16,500, as against £13,100. It is proposed to make a distribution of 20 per cent. on the share capital of £70,000, this contrasting with 16 per cent. in 1909.

Berlin Elevated Electric Railway.

The report of the Gesellschaft fur Elektrische Hoch und Untergrundbahnen, of Berlin, states that the traffic in 1910 experienced a further development in accordance with expectations. No extension of the network took place, and it consequently remained at 14·3 miles, but the works in connection with the prolongations both in the east and the west were actively continued. The grant of consent for the south-western extension lines, which had at last been secured after the settlement of the difficulties with the local authorities, was of decided importance for the future of the company and its lasting efficiency. The accounts show the following figures for the two years :—

	1910.	1909.
Share capital	£2,500,000	£2,500,000
Bond capital	2,498,000	1,995,000
Gross profits	278,000	237,000
Renewals fund	33,000	33,000
Depreciation	3,400	3,300
Net profits and balance forward	153,000	113,000
Dividend	116,000	81,000
Dividend, per cent. ...	5½	5

The number of passengers carried rose from 54,143,000 in 1909 to 56,886,000 in 1910, and the receipts per passenger advanced from an average of 13·18 pfennigs to 13·23 pfennigs. The service was undertaken by 133 motor-cars and 101 trailers, the trains being mostly composed of three to four cars, except in times of busy traffic, when six cars were formed into a train. Particulars are given in the report of the extensive works which were proceeded with during the year, and it is also mentioned that one half of a new 4 per cent. loan of £1,000,000 had been issued to defray the expenditure, whilst the other half is to be floated in the course of the present year.

German Atlantic Telegraph Co.

The report for 1910 of the Deutsche-Atlantische Telegraphen Gesellschaft, of Cologne, states that the Atlantic traffic experienced a moderate but constant increase, and the figures realised in 1909 were surpassed last year. A very considerable amount of traffic had also been received by the Vigo cable in consequence of political circumstances. The demands made upon the latter cable were so great that the question of duplicating it must be taken into consideration. Interruptions in the Atlantic cable did not take place, but the Vigo cable suffered interruptions from trawlers' nets, although they were quickly remedied and had no influence upon the traffic. The accounts show the following figures :—

	1910.	1909.
Share capital	£1,200,000	£1,200,000
Bond capital	930,000	943,000
Gross receipts	260,000	239,000
Working expenses and taxes ...	51,000	48,000
Cable repairs	5,200	6,700
Cable redemption fund	29,000	29,000
Depreciation	6,300	5,600
Net profits and balance forward	167,000	148,000
Reserve fund	37,000	31,000
Dividend	90,000	84,000
„ per cent.	7½	7

The amount carried forward is £25,000, as compared with £23,000 in 1909. It appears that various inquiries have been made as to the influence of wireless telegraphy on the remunerativeness of the Atlantic cable. The directors state, in this connection, that since the opening of the trans-Atlantic service by the Marconi Co., the Atlantic cable traffic has further increased and no prejudice of this traffic has been felt from any quarter. On the contrary, the extension of wireless telegraphy on ships and inaccessible islands has caused a new kind of telegraphic traffic to arise, which must be handed over to the cables and landlines for forwarding on, so that wireless telegraphy has to a large extent served as a feeder to the cables.

Vera Cruz Electric Light, Power and Traction, Ltd.—The directors' report states that the net profits in Mexico for the year 1910 amount to £24,107, as compared with £19,043 for 1909, an increase of over 26 per cent. The prospects continue to be favourable. It is anticipated that the Vera Cruz Terminal Co. will begin to take supplies of power and light under its contract in July next. The balance at the credit of profit and loss account amounts to £10,294, and it is to be carried forward.

Neuhausen Aluminium Industry Co.

The report of the Aluminium Industrie Gesellschaft, of Neuhausen, states that the industry failed to meet expectations in 1910. Although the consumption largely increased, the production constantly advanced beyond the growing requirements, and the low level of prices was only slightly improved, and business consequently remained scarcely remunerative. A fresh attempt was made by the principal producers to arrive at a syndicate agreement in the autumn, but this was frustrated owing to the high demands of one party. Immediately afterwards there again arose an embittered fight for contracts, the obtaining of which was only possible by making important concessions in prices. The wish, however, exists to see the situation of the market assume a normal and stable course, which would form the basis for a combination sooner or later. In the carbide industry an improvement had taken place in so far that after two years of negotiations an international syndicate was constituted in the course of the summer, and a more correct relation between production and consumption was consequently established at last. All the company's works were well employed during 1910; the output of aluminium was largely increased in accordance with the sales, and on the completion of the extension of the production, the company would remain at the head of European producers. The accounts show the following figures for the two years :—

	1910.	1909.
Share capital paid	£520,000	£520,000
Bond capital	206,000	213,000
Gross profits	160,000	125,000
Depreciation	44,600	37,000
Net profits and balance forward	138,000	124,000
Dividend, per cent.	14	12

After the setting in operation of the Rhone works, the large works at Chippis, in the Valais, were of considerable importance as nitric acid and nitrogen derivatives were produced as well as aluminium, and the derivatives were expected to more favourably influence the company's results in future years. The establishments in Germany and France for the manufacture of alumina had been extended in accordance with the growing requirements of the aluminium works, so that the company was completely independent of foreign alumina works in regard to this particular semi-finished material. The production of bauxite, which was the chief raw material had been so largely increased at the mines owned in the Department of the Var, that uninterrupted working of the alumina works was assured for a number of years.

Indo-European Telegraph Co., Ltd.

The meeting of this company was held at 18, Old Broad Street, E.C., on Thursday, April 27th, Mr. Charles Holland presiding. The chairman said that the year had been an uneventful one for the company, and a prosperous one. They had been singularly free from interruptions. The trouble that was chiefly exercising their minds last year—namely, the breaking by trawling vessels of the cables upon which they relied for their communications across the North Sea—had not visited them this fishing season, a thing for which they must be thankful. It was, however, none the less evident to the directors that additional accommodation was required in that direction, and they were still in communication with the General Post Office on the subject. Cables were always liable to breakage from this cause, and the trouble might recur during any fishing season, when one or more cables might be interrupted. It was then that the necessity for additional facilities was most seriously felt. Going further afield, they had been free from interruptions even in the most troublesome portion of their system in South Russia, except for a period of 10 days during February last, when their wires in the Caucasus collapsed under the weight of snow, which lay to a depth of from 5 to 10 ft., the result of a succession of blizzards of unprecedented severity. Once this was made good, and thanks to the efforts of their maintenance staff, it was done very quickly, their troubles came to an end, and they had, he was glad to say, had no serious recurrence. They still intended, when a favourable moment arrived, to add to the carrying capacity throughout their system, and had recommended a further appropriation with this object. Their daily direct working London-Karachi continued to be a most valuable asset, and it was really wonderful how much traffic could be carried in this manner with the accommodation at their disposal. The necessary assumption was, of course, that a long line such as theirs of 4,000 miles must be kept in the highest state of efficiency in order to fulfil its object, and that, he was pleased to note, was the case. Mr. Stratford-Andrews, the managing director, was continually experimenting with new methods and new instruments, and they might rely upon it that everything he could introduce to do full justice to the traffic was done. There had been no serious reductions of tariffs during the year, but the directors had with pleasure signified their concurrence in proposals placed before them in common with other companies by the Postmaster-General to enable senders of telegrams in plain language to do so over certain routes at considerably reduced rates, subject only to deferment to the general class of fully-paid telegrams. This proposal was considered by a Committee appointed by those interested, of which Mr. Stratford-Andrews was a member. The details still remained to be worked out. The casual sender of the usually short telegram of a family or social nature would have things made easier for him, while the merchant with his complex codes was already, in their opinion, sufficiently provided for. Their receipts from traffic continued to be very satisfactory, not only those from what they used to regard as their mainstay, namely, the Indian and trans-Indian traffic, but from the South Russian, Turkish and Persian traffic. The pronounceable-combination system of codes was still with them unfortunately, and added not only to the number of official repetitions asked for, which was an ever-increasing evil, but to the anxieties of the clerks who transmitted them. The directors had recognised the good work done by them and by the officers and staff generally, by voting them a bonus of about £3,400. They thought it fitting that staff should, at reasonable intervals of time, receive some encouragement of this kind when things were going well with the company. In this connection he might mention that the last bonus was distributed six years ago. Turning to the accounts in general, the revenue from message receipts and other sources as shown in the revenue account showed a satisfactory increase of £9,945. The combined commercial and maintenance expenses showed an increase of £2,573, which, however, was explained by the inclusion of the bonus to the staff of £3,406. The balance-sheet contained no additional features calling for remark, though the item of sundry credit balances showed an increase over last year of about £22,000, the chief item of which was the £15,000 allocated during last year towards increasing the carrying capacity of the system and not yet expended. It had not been found necessary, at present, to make any further grant to the retirement fund which was already represented by investments to the total value of over £40,000, a result which, thanks to the generous contributions of the shareholders, would go far towards the object required of it. They therefore carried forward to the credit of 1911 the sum of £11,327. That was all he had to say as to the year 1910 covered by the report and accounts. Perhaps they would not mind his taking a short anticipatory excursion into the three working months of 1911 for which figures were available. They showed an increase of revenue even on the figures laid before them to-day, so that, assuming that working conditions remained favourable during the rest of the year, they might possess their minds in peace. He might remark at this point that the articles of association of the company, which were drawn up as far back as the year 1868 were, with the various alterations and additions to company law during the 40 years which had elapsed, no longer suitable to modern requirements. The company's solicitors had now recommended that the entire set of articles should be re-drafted. The fresh set of articles of association as re-drafted would be presented to them for adoption at an extraordinary general meeting to be held at an early date.

The motion was seconded by Sir William Brooke, K.C.I.E., and carried unanimously. The meeting closed with a vote of thanks to the staff and board of directors.

Austrian Electrical Companies.

The A.E.G.-Union Electricity Co., of Vienna, proposes to pay a dividend of 7 per cent. for 1910, or the same rate as was distributed in the previous year. It is intended to increase the share capital from £333,000 to £500,000, and the new shares are to be taken over by the Land Credit Anstalt, the Austrian Credit Anstalt, and the A.E.G., of Berlin.

The Electricity Co. (late Kolben & Co.), of Prague, reports an increase of 20 per cent. in the turnover in 1910, but in consequence of the competition of German firms, no profits were obtained from the manufacture of ordinary types of electrical machinery. Nevertheless, the profits permit of the payment of 6½ per cent. for 1910, as against 6 per cent. in the preceding year. It is proposed to proceed with an increase in the share capital from £166,000 to £250,000.

The report for 1910 of the Felten & Guilleaume Co., of Vienna, states that although the slow course of business at the beginning of the year was succeeded by a slight improvement later on, neither the company's turnover nor its profits reached the level which obtained in 1909. After making provision for depreciation, the net profits are returned at £84,600 for 1910, as contrasted with £105,000 in the previous year. A dividend of 15 per cent. is in contemplation, being the same rate as was paid for 1909. The prospects for the current year are declared to be more favourable as the orders brought over from 1910 show an increase, and it is considered that the State will at last be compelled to take steps to proceed with extensions of the telegraph and telephone network, whereby work would be entrusted to the company.

The directors of the Hungarian Felten & Guilleaume Co., of Buda-Pesth, state that the year 1910 was characterised by great activity, which was materially contributed towards by the favourable harvest, and Government orders also yielded satisfactory work. If, nevertheless, the results did not improve, the cause was to be found in the circumstance that the prices of individual products fell below the prime costs. The accounts exhibit net profits, after making allocations to the depreciation and reserve funds, of £24,600, or nearly the same as in 1909. It is proposed to pay a dividend of 15 per cent. on the share capital of £62,500, being the same rate as in the preceding year.

Submarine Cables Trust.—The report states that the revenue for the year amounted to £25,205, and the expenses to £1,172, leaving a balance of £24,033, plus £175 brought forward, making an available balance of £24,208. After providing £17,583 to meet payment of the coupons, £6,578 has been transferred to the redemption fund, leaving £46 to be carried forward.

Rangoon Electric Tramway and Supply Co., Ltd.—The directors have declared a dividend of 4 per cent. on the ordinary shares for the year to December 31st.

Metropolitan Electric Tramways Co., Ltd.

In spite of the 5½ per cent. ordinary dividend recently declared by this company, which is a subsidiary of the B.E.T., otherwise the British Electrical Federation, the report and accounts have been received by the proprietors of the deferred shares with evident traces of regret, whilst there are many points in the accounts generally which require treatment before they can be regarded as satisfactory. In the meantime, we should imagine that no investor is likely to be eager to assist the B.E.T. in the gradual unloading of their paper, if such be their intention.

Mr. Garcke in his speech referred to the deferred shares. It will be remembered that the M.E.T. issued 314,016 deferred shares of £1 each as fully paid, some years ago, to the North Metropolitan Tramway Co. shareholders, which the B.E.T. will recognise was part of the scheme or *modus operandi* towards obtaining the eventual control and acquisition of the North Metropolitan Tramways Co., and that in due course a seat was found on the board of the North Metropolitan Co. for one of its representatives. The B.E.T. scheme, which was successful, may be stated as follows:—

The North Metropolitan Tramways Co. had an issued share capital of some 110,000 shares of £8 each (£2 had been returned some years previously to the shareholders), and of such issued capital the M.E.T. by the scheme of practical absorption, which may be said to have marked the beginning of the end of the N.M.T., secured 78,504 shares, in return for which the M.E.T. issued—

314,016 preference shares of £1 each,
314,016 deferred shares of £1 each,

as fully paid to the North Metropolitan shareholders in exchange for their 78,504 shares mentioned.

The M.E.T., the subsidiary of the B.E.T., also issued as fully paid to the B.E.T. 78,504 fully-paid ordinary shares of £1 each "in return for their services," so that *per se* the transaction cost the M.E.T. as follows:—

Shares Acquired.

78,504 shares of £8 each in the North Metropolitan Tramways Co., at cost	£706,536

and the composition of the cost was, of course, as under:—

314,016 preference shares of the M.E.T. issued to the N.M.T. shareholders	£314,016
314,016 deferred shares of the M.E.T. issued to the N.M.T. shareholders	314,016
78,504 ordinary shares of the M.E.T. issued to the B.E.T. in payment of its services ...	78,504
	£706,536

Were not the 314,016 deferred shares issued to the N.M.T. as a sop—merely a means to an end? That they are likely to be worthless is not a remote idea, as, subject to the rights attaching to the preference shares, the *ordinary shares* are entitled to receive out of the profits of each year a fixed preferential dividend at the rate *of* 8 *per cent. per annum* on the capital for the time being paid up thereon, and rank, both as regards dividend and capital, after the preference shares, and any surplus profits and, in a winding up, any surplus assets after repayment of capital, are divisible in equal proportions between the holders of the ordinary shares and the holders of the deferred shares.

Whilst appreciating Mr. Garcke's remarks at the general meeting anent the deferred shares—which, we fear, may be regarded *cum grano salis*—the question is whether it was part of a "just arrangement" to issue such shares if it were within his then knowledge that they would be practically of no value to the shareholders. He said that George Richardson, a director of the M.E.T. and chairman (of what remains) of the N.M.T., would confirm his remarks as to the issue of the deferred shares being part of an equitable arrangement. If, however, Mr. Adamson, who was the able managing director of the N.M.T., were living, we should have been pleased to have heard his opinion of the advent of the B.E.T. with the N.M.T. Evidently the whole of this £706,536 is still included in the capital expenditure account of the balance-sheet, though the North Metropolitan Tramways Co. is near the end of its existence. It must be remembered, also, that the whole cost of the electrification is charged to capital, which still contains the £200,000 or £210,000 paid to the North Metropolitan Tramways for that part of its system in Middlesex, less minor credits for sale of old materials. Similarly, in regard to the Harrow Road and Paddington tramways—*i.e.*, amount paid from shares, &c., less credits. The £200,000 was satisfied as to £50,000 in cash, and the M.E.T. guaranteed the repayment of the principal and payment of the interest on the N.M.T. 3½ per cent. debentures, some, if not most, of which have been redeemed by the exchange of M.E.T. debentures therefor. A detailed statement of the capital expenditure of the M.E.T. would be useful. And in addition to the 78,504 shares above-mentioned, what of the other large allotments of shares from time to time to the B.E.T.? It will be thus seen that much water is required to flow out of the capital to the profit and loss reservoir before the account can be regarded with satisfaction.

The 5½ per cent. return upon an ordinary share of the nominal amount of £1 purchased at the present market price may prove an advantageous transaction *per se*; but it is a poor return upon an industrial share at par, and it is possible that the majority of the shareholders of the M.E.T. are par holders, as is not unusually the case in tramway undertakings. As is somewhat usual with the M.E.T., £1,180 of salaries is taken out of the profit and loss account and charged to capital. Credit is taken in the profit and loss account for the balance of the dividend received from the N.M.T. in 1906—viz., £5,887 16s., an amount which, with those previously taken into profit and loss, might have been appropriated in reduction of capital expenditure in view of the few references which we have just made. The carry forward is only £2,821, so that if the M.E.T. had not capitalised the proportion of salaries, and had it capitalised the £5,887 above-mentioned, there would not have been an extra ½ per cent. For instance:—

Balance brought forward from 1909		£3,578
Add credit balance of profit and loss account ...		53,767
		£57,345
Deduct:—		
Proportion of salaries charged to capital	£1,180	
N.M.T. dividend	5,887	
		£7,067
		£50,278
Appropriation:—		
Reserve, say	£6,000	(as against £8,000)
Preference dividend	25,000	
5 per cent. dividend on ordinary shares	19,566	(as against 5½ p.c.)
	£50,566	

But, of course, this ½ per cent. will make an appreciable difference or increase to the profit income of the B.E.T. Discounts and commissions still appear in the balance-sheet at £95,761. This, of course, is not asset at all.

No details of the North Metropolitan Electric Power Supply or the North Metropolitan Electric Power Distribution Co.'s accounts are appended, the directors of which are substantially those on the board of the M.E.T., and are they not nominated by the B.E.T.?

A paragraph in the report is that the L.C.C. gave the M.E.T. notice of their intention to purchase the company's tramway situated between Finsbury Park and Manor House, half a mile in length and forming part of an important connection. Negotiations, it is stated, are proceeding with the County Council as to the purchase price, and for the continuance of the company's user of the tramway after the purchase is effected. No doubt the Council will secure the ownership of the lines. It is to be hoped that the L.C.C. will make a good bargain for the community.

La Plata Electric Tramways Co., Ltd.

The report of the directors, which was presented to the second annual meeting, held at 52, Moorgate Street, E.C., on Tuesday last week, stated that the result of working for the year ended December 31st, 1910, showed, after providing for debenture stock interest, a credit to revenue account of £4,148.

The balance necessary to pay the 6 per cent. dividend on the amounts paid up on the preference shares has been provided in accordance with the guarantee of the La Plata Syndicate, Ltd., and the balance dividend on these shares, making up 6 per cent. per annum, was accordingly paid on April 1st, 1911. During the whole of the year the traffic has suffered the disadvantage of the concurrent working of two systems of traction and has also been considerably impeded by extensive paving operations by the municipality. On January 16th, 1911, horse traction was superseded on all sections but Ensenada. Work on this latter section is at present in abeyance pending the ratification by the Legislature of a decree of the executive granting a new route from La Plata to Ensenada.

The following is a comparison of the traffics for the two years ending December 31st, 1909, and December 31st, 1910:—

	Passengers carried.	Receipts.
1909	2,141,841	£22,413
1910	3,564,576	34,483

The total receipts as cabled for the first three months of the current year were £12,543, of which £11,072 was derived from electric traction. This figure of £12,543 compares with £7,100 for the corresponding period of 1910.

Mr. W. F. Hamilton, K.C., presided at the meeting, and in moving the adoption of the report he said that the total receipts in La Plata amounted to £34,483, of which £21,691 was derived from electric traction. The directors considered this satisfactory, taking into consideration the abnormal conditions prevailing during the past year, and the great interruptions to traffic caused, in the first place, by the construction work, and, secondly, by the very extensive new paving work commenced by the municipality in September last necessitating continual modifications to existing running. There was no doubt that but for these impediments the receipts would have been considerably greater. On the electric section the takings during the past year had averaged 1s. per mile run, and the expenses—so far as they had been able to apportion them as belonging to the electric working—averaged 67·5 per cent. of the receipts, which would bring the expenditure on the electric sections up to 8d. per mile run. This was high, but was, of course, explained by the difficulties already mentioned, and by the fact that they were only gradually opening the services to electric traction. At the end of the year only 14½ miles of single track had been opened for electric traction, and they consequently were only able to spread many of their fixed charges over the earnings of that mileage. A considerably greater number of miles was now being run, and that mileage would be materially increased when horse traction was completely eliminated. The net result of the working was a balance to the credit of revenue account of £4,148. As the 6 per cent. dividend on the amounts paid up on the preference shares absorbed £6,475, the guarantors had made good the difference, and the balance of dividend making up 6 per cent. for the year, was accordingly paid on April 1st last. With the exception of a second line in calls No. 7, the construction work

was now finished in La Plata, but owing to the frequent changes necessitated by the extensive paving works undertaken by the authorities, the system had been, and would be for some time longer, in a disturbed state. With regard to the Ensenada section, when he was in La Plata last year he inspected, with Mr. Boutell, their local director, an alternative route to Ensenada offering many advantages over the old route both from the point of view of construction and traffic. It was decided to apply for a modification of their concession empowering them to substitute the alternative route for their present horse tramway route. By decree, dated November 2nd, 1910, the Minister of Public Works granted the company the right to such modification, subject to the same being approved by the Legislature which was then in recess, and when the Chambers met again this month the necessary steps would be taken to obtain this formal sanction. He was glad to be able to testify to the great progress which La Plata had made since his former visit to that city in 1906. Its new sanitary works, new paving, parks and open spaces now artistically laid out, its proximity to the Port of Ensenada, its spacious streets and avenues and magnificent public buildings, all indicated progress and prosperity. Many new buildings were being erected, and the installation of electric traction had given a further impetus to building, both in the city and its suburbs. Steps were now being taken to electrify the competing tramway lines, hitherto run by horse traction, but there was room for both systems, and he considered their business good and sound. While in La Plata audiences were granted to him by the following Ministers of the Province, namely, the Governor, the Minister of the Interior, and the Minister of Public Works. He also had a long interview with the Municipal Commissioner. He was well received, and was glad to report that their relations with all the authorities were on a satisfactory footing. They had just received by cablegram the traffic receipts for the month of April, which showed an increase of £1,303 over the corresponding month of last year, and an aggregate of receipts from January 1st of £16,593, the aggregate increase for the four months being £6,746. As in the company's prospectus the estimated earnings, when all the sections were completely electrified, were placed at £40,000, and the Ensenada section had not yet been begun, the board felt hopeful about the future. In anticipation of requirements, they had found it necessary to provide further rolling stock and car-shed accommodation, and there had been other additional capital expenditure incurred over and above the amount of the construction contract. Eventually they would have to provide further capital, which they could do by the issue of an additional amount of 5 per cent. debenture stock, of which at present only £30,000 had been issued.

Replying to questions, the CHAIRMAN said they had no returns which would enable him to say what was the ratio of working expenses to receipts in the four months. The present disturbed condition of the streets interfered with their traffic very much, and increased their expenses so that even if they had the figures for the last four months it would not, in his opinion, show them what the percentage of receipts to expenses would be when the paving works were finished, and when their system was in full working. It was the intention of the board to call up the remaining 2s. 6d. on the preference shares before issuing any debenture stock. They would call up that 2s. 6d. directly they required the money, which would be very shortly. They had raised the point of compensation for the loss caused the company by the disturbance to the streets, but, of course, he could not say whether they would be successful. The enormous sums which were being spent on paving works in La Plata would very much improve the city, and make it a much more attractive place for people to live in. When they once got the approval of the Legislature for the completion of their new routes, the construction could be done in two or three months.

The report was adopted.

Brisbane Electric Tramways Investment Co., Ltd.

THE directors in their report state that the dividends on the shares held by the company for 1910 amount to £105,929, plus sundry receipts £57, and amount brought forward £1,952, leaving a balance to credit of revenue account of £107,938. After deducting income-tax and general charges in London and expenditure in Brisbane, including the insurance undertaken by this company under its contract with the Tramways Co., £9,903 there remains a net balance available of £98,035. The debenture stock interest has absorbed £19,069, and interim dividends have been paid on the preference and ordinary shares, amounting to £23,828. There thus remains a sum of £55,138, and the directors recommend that this be appropriated in the following manner:—In adding £27,784 to the reserve fund (bringing it up to £42,000), in payment of the balance dividend on the preference shares, making up the full dividend at the rate of 5 per cent. per annum, £8,828; in payment of a balance dividend of 4s. per share, free of income-tax, making, with the interim dividend paid in November, a total dividend on the ordinary shares of 8 per cent. for the year, £15,000, carrying forward £3,526. The result of the working of the tramways, as shown by the audited accounts of the original company for the year ending December 31st, 1910, is:—Total receipts £222,580, total expenditure £115,694, leaving net profit for year £106,886, plus the amount brought forward from 1909, £2,023, leaving a balance of profit available of £108,909, which has been appropriated by the Tramways Co. in the following manner:—In payment of dividends on shares (including income-tax), £106,000, carrying forward to next account £2,909.

MR. H. R. BEETON (chairman) presided over the tenth annual general meeting at Winchester House, E.C., on Wednesday last week. In moving the adoption of the above report, he said it was again his pleasing duty to comment upon a highly successful year. The total receipts for 1910 showed an increase of £23,302, whilst the expenses had increased by £10,740, the increased net profit being £12,562. The aggregate of renewals and reserve funds and undivided profits would now amount to £126,934. The total number of passenger carried in 1910 were 32,419,276, being an increase of 2,686,938, which was equivalent to carrying the whole population of Brisbane about 230 times during the year. The increase in car-miles run during the year was 202,233 or 6·09 per cent., over the previous year. The increase in working expenses amounted to 10·18 per cent., due partly, of course, to the increased mileage, but partly to the increased cost of materials owing to the general rise in wages, consequent upon labour legislation. Their business in the sale of power continued to increase, and showed a profit of £950 over the figure of the previous year. Many newly erected wharves with wool stores were now taking current from them. The Adelaide Steamship Co. was installing an electric crane, and the New Zealand Loan and Mercantile Agency Co. and the Australian Estates Co. had installed electric wool conveyors and stackers all operated from their mains. During the past year they had the advantage of Mr. Badger's presence in London, and had had many conferences with him on matters affecting the company's interests; and Mr. McIlwraith, who was now on his way home from Queensland, had visited Brisbane and conferred with Mr. Badger on the spot. The prospects for the current year were good, so far as the volume of business was concerned. Already the rainfall was above the average, and another good season seemed assured. Under ordinary conditions a long period of prosperity might be looked forward to. The industrial position, however, was not entirely free from anxiety, and in these circumstances, as at all times in the management of their business, they could not appreciate too highly the benefit derived from the experience, tact and devotion of their manager, Mr. Badger. Their receipts for the first quarter of the current year showed a total increase of £6,061. The proposals made by the local authorities with the regard to the construction of certain extensions to which they referred last year were still under consideration. The attention of the board of directors was recently called to statements publicly made in Queensland that the local authorities had power at any time after 1920 to purchase the company's undertaking at the construction value of the tramways, less depreciation. It was fitting, therefore, to say that the directors had obtained the opinions of Sir Robt. Finlay, K.C., Mr. Rowlatt, and also of Mr. Edward Carlile, K.C., of Melbourne, who advised that the local authorities, if they ever exercised the power, must pay the commercial value of the tramways as a going concern, and that these opinions agreed with the advice previously given to the board of directors by other eminent lawyers.

MR. CONCANON seconded the motion.

The REV. M. ROOTHAM, whilst agreeing that the management of the company was good, asked that the board should consider the question of paying an increased dividend. He also thought the board should be very careful with regard to extensions, for it was quite likely that they might adversely affect the company's position.

The CHAIRMAN said the board were fully alive to the importance of the subject of extensions, and only those would be constructed which they felt would be for the benefit of the shareholders. They felt that the dividend proposed was a fair return on the money invested in the undertaking.

The report was adopted and the retiring directors were re-elected.

Continental. — FRANCE. — The balance-sheet of the Société Lyonnaise des Forces Motrices du Rhone, of Lyons, for the last financial year, shows a net profit of £107,046, as compared with only £100,807 in the preceding 12 months.

La Compagnie Française pour l'Exploitation des Procédés Thomson-Houston, of Paris, has just issued its report for the last financial year. It shows a profit of £163,076, as compared with only £153,368 in the preceding 12 months.

BELGIUM.—The Société A.E.G.-Union Electrique, of Brussels, in its report for the last financial year, states that "the general improvement in business which seemed probable at the beginning of 1910 did not materialise to any marked extent; nevertheless, owing to the ever-increasing applications of electricity, there was a much larger amount of new business offering, which has helped us to increase our turnover. There is a more and more pronounced tendency to adopt turbines in the place of steam engines, and we have secured a large number of orders for our A.E.G.-Curtis turbine-alternator sets." The balance-sheet shows a net profit of £15,609.

The balance-sheet of the Antwerp Telephone and Electrical Works Co., of Berchem, Antwerp, for the last financial year, shows a profit of £542.

GERMANY. — The Berlin-Hagen Accumulatoren Fabrik Gesellschaft, of Berlin, reports a net profit of £82,261 for the last financial year, as compared with £79,444 in the preceding 12 months. The dividend is being increased from 12½ per cent. to 15 per cent.

The Gesellschaft Mix & Genest, Telephon und Telegraphenwerke, of Berlin, reports a profit of only £17,830 for the last financial year, as compared with £20,046 in the preceding year. A dividend of 3 per cent. is, however, being maintained.

Hastings and District Electric Tramways Co., Ltd. — The petition for reducing the capital from £500,000 to £372,942 10s. is to be heard on May 16th.

Adelaide Electric Supply Co., Ltd.

On Tuesday an extraordinary meeting of the preference and ordinary shareholders of the above company was held at the offices, Finsbury Pavement House, E.C., to consider a resolution for the raising of further capital to develop the undertaking.

Mr. J. B. Braithwaite, chairman of the company, who presided, proposed a resolution authorising the directors to borrow an amount not exceeding £150,000 by the issue of debenture stock. He said that the company found that it was absolutely essential to provide further capital to meet the rapid growth of its business in Adelaide. The board had two alternative methods by which further capital could be raised. In the first place they possessed power to issue ordinary shares, and they could also make an issue of debentures, and after giving the question the greatest consideration they had come to the conclusion that the best course was to make a debenture issue. They had arrived at that decision for three reasons. First, the Government of South Australia possessed the right to purchase the company's undertaking at intervals of two years, and therefore it was deemed desirable to preserve for the existing shareholders their rights to the fullest possible extent; for if they watered the ordinary shares they would not have any means of getting rid of them should the Government decide upon exercising its power of purchase. In the second place, the company at the present time was earning exceptionally large profits, and they must utilise some of the extra surplus in redeeming their liability. They would not be able to do that if they were to make an issue of ordinary shares. The third point which had led them to make an issue of debentures was that they would be able to raise the money at a lower rate of interest than they were paying in ordinary dividend. In conclusion, he said that preference in allotment would be given to the existing shareholders of the company who desired to take up the debentures.

Mr. A. F. Farish seconded the motion, which was agreed to.

Great Northern Telegraph Co., Ltd. (of Denmark).

The general meeting of this company was held at Copenhagen on April 29th. The financial statement then adopted showed that the total receipts during the year 1910, including the balance brought forward from 1909, amounted to £625,993, and the expenses to £171,988, leaving a net profit of £454,005. This is being distributed as follows:—Reserve and renewal fund, £55,556; pension fund of staff, £11,111; remuneration to directors, £2,500; interim dividends already paid, 5 per cent., £75,000; final dividend proposed, 7½ per cent., £112,500; bonus proposed, 5½ per cent., £82,500 (making a total of 18 per cent.), £270,000; leaving £114,838 to be carried forward. The reserve and renewal fund now amounts to £2,271,484, less depreciation of investments, £39,700, £2,231,784. The investments made on account of the reserve and renewal fund have been increased during the year by £124,373. The renewal fund for cable steamers remains unaltered at £69,283. The dividend equalisation fund amounted on January 1st, 1910, to £388,853, plus interest £15,554, £404,407. Participation in other telegraph undertakings amounted on January 1st, 1910, to £629,489, less amortisation £3,003, £626,486.

The Chairman, Commodore E. Suenson, D.R.N., said that the condition of the cables had been about normal. In Europe there had been 21 interruptions on 10 cables, and in the Far East 15 on six cables. Cable repairs and renewals had kept their cable steamers occupied: The *H.C. Orsted* in Europe for 112 days, and the *Store Nordiske* and the *Pacific* in the Far East for 264 days, of which eight in Europe, and 65 in the Far East, were for the account of other Administrations. The landline routes *via* Kiachta and *via* Wladiwostock connecting the two submarine systems had worked very satisfactorily, notwithstanding the fact that on the former a number of telegraph poles were renewed in the course of last summer. The Chinese Administration have introduced a more effective inspection of the lines. With reference to the decision of the Norwegian Government not to extend the company's concessions beyond 1910, and also of the desire of the Japanese Government to acquire the cable between Japan and Korea before the expiration of the concession in 1912, the year 1910 has witnessed the consummation of these decisions. The separation from Norway was solely due to the determination of the Government, whilst that from Korea was entirely voluntary on the part of the company. Concerning the financial result of the negotiations for the cession of the three cables, viz., the cable between Norway and Scotland (Egersund-Peterhead); the cable between Norway and Denmark (Arendal-Hirtshals); and the Korean cable (Tsushima-Fusan), notwithstanding all the directors' efforts, the total payment for these three cables, with accessories, such as cable huts with furniture, instruments, &c., and including compensation for the revenue of about two years on the Korean cable, which is lost in consequence of the premature transfer of this cable, does not amount to more than, approximately, £32,000. This result was far from satisfactory, but on the expiration of the concessions they were more or less at the mercy of the Governments, and they had in their financial policy always kept in mind this contingency. Whilst regretting the loss of these three cables, it had given them great satisfaction that the British Government had entrusted the company with the working in the United Kingdom on behalf of the G.P.O., not only of the Egersund-Peterhead cable, the service of which thus continues in the company's hands, but also of a new cable, laid in the months of October and November last by the two Governments, between Newbiggen, in England, and Arendal, in Norway. This arrangement will, it is true, in no way reduce the financial losses resulting from the cession of the Egersund-Peterhead cable, but it is a highly gratifying proof of the good feelings of the General Post Office towards the company, and of their appreciation of the services which the company have been rendering to the telegraphing public for more than 40 years. Furthermore, the General Post Office had jointly with the Norwegian Telegraph Administration, entrusted to the company the maintenance of the two Anglo-Norwegian Government cables mentioned above, and the company had entered into a similar arrangement with the Norwegian and Danish Telegraph Administrations for the repairing of the Dano-Norwegian cable between Hirtshals and Arendal. They considered this a compliment to their engineering and cable steamer staff. The above-mentioned arrangements had been entered into provisionally for a term of five years.

During the past year they had also negotiated a new agreement with the General Post Office for the working of those of the company's other cables in Great Britain, for which the landing licences were prolonged in 1905. The old conditions had been only slightly varied, but unfortunately not to the company's advantage.

Unless an extraordinary increase of traffic should mitigate the loss caused by the transfer on January 1st to the Governments concerned of the two Norwegian cables and the Korean cable, the company's telegraphic receipts would fall off considerably in the current year. This decrease would be further aggravated by the tariff reductions which they had had to introduce in order to maintain the equality of the rates existing between the United Kingdom and the three Scandinavian countries before January 1st last, when all the cables were the company's property, but which equality was disturbed by a reduction of the rate between the United Kingdom and Norway coming into force on that date.

The General Post Office and the Swedish Telegraph Administration had readily accepted the company's proposal for a similar reduction of the rates for the Anglo-Swedish and Anglo-Danish traffic. The reduction of the first-mentioned rate had already come into force, but they were still awaiting the decision of the Danish Telegraph Administration as regards the reduction of the rate for traffic exchanged between the United Kingdom and Denmark.

Reductions of rates had been introduced between Sweden and Russia (Finland), as well as in the Far East, the company bearing a proportionate share.

Although these reductions would necessarily reduce the value of the traffic, they must be prepared to meet the requirements of the constantly growing telegraphic correspondence by increasing the number of the company's cables between several of the countries which had prolonged their concessions. In this respect they had already obtained the consent of the Telegraph Administrations of Russia and Sweden to lay a new cable, the fourth, between those countries, which would soon be taken in hand, and they were also going to draw largely on the company's reserve fund with the object of assisting the Chinese administration in their efforts to improve and extend the telegraph service in the Celestial Empire.

In view of the inevitable decrease in traffic receipts from January 1st last, it was satisfactory to report that the receipts had exceeded expectations. Thanks to this and a small increase in revenue from other sources, and also, on the other hand, to an accidental decrease in expenses, the net revenue of 1910 had been about £23,400 higher than that of the previous year. This enabled them to maintain a total dividend of 18 per cent., as in the last preceding years, and at the same time to transfer a somewhat larger amount to the year 1911, in order to meet the effects of the decrease of the receipts which they anticipated during the present year. The usual amount had been transferred to the reserve fund, while the contribution to the pension fund had been increased by one-third. The chairman alluded briefly to the death on February 4th last of Mr. P. Vedel, at 87 years of age, who rendered exceptionally valuable services as director-general of the Foreign Office in Copenhagen for more than 40 years (1858-1899). When Mr. Vedel in 1898 wished to be released from the heavy burdens of an office which he had filled so well, he accepted a seat on the board, where during the remaining twelve years of his life they had his sympathetic co-operation. The board has provisionally requested His Excellency P. Lovenorn, late Danish Minister at St. Petersburg, &c., to fill the place left vacant by the death of Mr. P. Vedel.

Stock Exchange Notices.—Applications have been made to the Committee to appoint a special settling day in, and to grant a quotation to:—

Mexican Northern Power Co., Ltd.—Scrip fully and partly paid for $4,500,000 5 per cent. first mortgage 30-year gold bonds.

And to allow the following securities to be quoted in the Official List:—

Brush Electrical Engineering Co., Ltd.—£100,000 5 per cent. prior lien debenture stock.

Mexican Light and Power Co., Ltd.—Further issue of $600,000 7 per cent. cumulative preference stock in shares of $100 each.

The Committee has ordered the undermentioned securities to be quoted in the Official List:—

Melbourne Electric Supply Co., Ltd.—£174,170 consolidated ordinary stock, in lieu partly of the 6 per cent. cumulative preference stock.

Pachuca Light and Power Co.—$800,000 5 per cent. first mortgage 50-year bonds, Nos. A 1 to 7,000 of £100, and B 1 to 5,000 of £20 each.

Official Announcements re Companies.—The following are to be struck off the Register in three months, unless cause is shown to the contrary:—

Aberdare Electric Lighting Co., Ltd.
Albion Battery Co., Ltd.
Buenos Ayres Electric Light Co., Ltd.
Heswall District Power Co., Ltd.
Private Wire and Telephone Installation Co., Ltd.

Calcutta Electric Supply Corporation, Ltd.—The directors, after placing £20,000 to the credit of the depreciation and renewals account, and £7,500 to the reserve fund, recommend the payment of a final dividend on the ordinary shares for the half year ended December 31st, 1910, at the rate of 10 per cent. per annum, making 8½ per cent. for the year, and to carry forward a balance of £5,621. The dividend will be payable on 25th inst.

Elmore's German and Austro-Hungarian Metal Co., Ltd.

Mr. J. MacFarlan presided on Wednesday at Finsbury House, E.C., over the annual meeting of this company. He said it was with feelings of grave disappointment that the directors met them, for they had hoped that they had put behind them for ever the possibility of presenting a balance-sheet showing a loss. Unfortunately, however, their hopes had not been fulfilled, for during the year 1910 a price war was commenced, and they, as one of the principal producers of copper tubes, were compelled to join in the fray. The result had been a bad one for every firm concerned, and although at the moment he was unable to prophesy when they would return to normal times, he was glad to say that they had put forward a proposition, which they hoped would be accepted by all parties, and so end at an early date a contest which had been disastrous to the trade generally. The trouble came at a very inopportune time, for trade was good, and they were able to increase the weight of their sales by nearly 11 per cent., or more than 200 tons, with a corresponding decrease in the cost of production per ton. While, however, the profit and loss account of the company showed a loss of £5,000, if they took the actual assets of the two companies, compared with the increase in the liabilities, the diminution was really less than £2,000. There was another bright spot in the dull outlook, for a possibility existed of the company earning substantial profits apart from any that might be obtained from the sale of goods of their ordinary manufacture. A circular was sent out in July last, in which it was intimated that arrangements had been made for the supply of copper rollers required for the proper working of an invention connected with the printing trade. Since the circular was issued, much had been done to perfect that process, and it had been taken up by several influential newspapers in Germany and France. The rollers produced by the Elmore process were the most suitable for the work, and a contract had been entered into with the Mertens Gesellschaft, the company which owned the patents, for the sole supply of such rollers to their licensees, upon remunerative terms. At one time they believed it would be necessary to propose somewhat drastic measures with regard to the re-arrangement of the capital of the company, but in consideration of the great strides which the Mertens process had made within the last three months, they thought they were justified in waiting for another year, in order to see whether their hopes in that direction were fulfilled, as in that case they believed that their financial difficulties would not be difficult of solution. They had expended the sum of £11,300 by way of interest, &c., upon loans. This sum represented a dividend of about 5 per cent. upon the whole of the capital employed in the company, and if that sum was added to the amount deducted from profits on account of depreciation and repairs and maintenance of plant, say, £4,500, they would realise the really large amount of profit they had earned, although the accounts actually showed a loss. With regard to the present year, the increase in the sales had been maintained, and compared with the same period last year, it was 13½ per cent., while the difference between the selling price and the cost of the raw material was somewhat higher. Naturally, they were deriving some benefit from the extensions and additions they made to the buildings and plant last year, and with an early settlement of the syndicate question, they should, apart from any profit to be derived from the Mertens agreement, show a greatly improved result from the year's trading. The works at Schladern had been fully maintained in efficiency. £7,814 had been expended in extensions and additions to buildings and plant, which were now nearly complete, and they hoped that expenditure in this direction would not exceed £1,000 during the present year. The directors, who had just returned from their annual inspection, were fully satisfied with the arrangements made by their works manager, Mr. Preschlin, to cope with the ever-increasing demand; but in order that the shareholders should have an independent report, they invited Messrs. F. Barkworth, O. Nettlefold and W. A. C. Strettell, who represented a large sum of debenture stock and shares, also to visit the works.

Mr. J. Heal seconded the motion.

Mr. W. A. C. Strettell, reporting on his visit to Schladern, said that not having seen the works before, he was surprised at their magnitude, and what appeared to be the complete equipment with which they were furnished for the production of copper tubes. The works were admirably situated—they were in direct communication with a main line of railway; a good deal of the motive power was produced by two turbines, and they appeared to be established on an ideal site. They followed the course of manufacture by both the electrolytic and mechanical processes from the raw copper stage right up to putting the goods upon the railway trucks at the siding. They saw tubes being produced. They saw the solid billet of metal put into the piercing machine and emerge in a few seconds a hollow tube. There were draw benches of all sizes, and one great hydraulic push bench, which they were informed was capable of exerting a pressure of 500 tons, while the works contained a complete array of tools of all kinds, such as lathes, drilling machines, &c. What perhaps struck them most was the coating of iron drums, which must have weighed quite a ton each; and it spoke volumes as to the value of the Elmore process of depositing copper, when they considered that these drums were sent from very long distances and returned again after being coated. The freight alone must cost more than the value of the finished drum. They also noted to what a large extent compressed air was used in connection with labour-saving appliances, and he would like to express their admiration of the way the works manager, Mr. Preschlin, had laid out the works. They were very pleased with all they saw, and were satisfied that if the negotiations for the revival of the syndicate, which were now pending, were brought to a satisfactory conclusion, there was no reason why the company should not prosper, apart from the success or otherwise of the Mertens process.

Mr. O. Nettlefold, who had also visited the works, endorsed the remarks of the last speaker. He said they had suffered the pinch of cutting prices, and he did not think it could be long before a fresh ring was formed. He believed the time was not far distant when they would have dividends, and not hopes.

Replying to Mr. Palmer with respect to the item for income-tax in the balance-sheet, the Secretary said that it was paid in respect of the profits in the German company, which, according to a recent decision in the Courts, they were bound to pay.

The report was adopted.

City of Santos Tramways.

At the meeting of the City of Santos Improvements Co., Ltd., held in London recently, the chairman, Mr. D. M. Fox, referred to the vexatious delay in the matter of the definite contract with the Camara municipal authority for the complete electrification of the entire system of tramways in Santos. The disturbing element had at last been removed. It was also most gratifying to find that the effect of the partial electrification of the tramways (say, 15 miles out of a total of 34 or thereabouts), with the improved and more rapid service, had resulted already in a great impulse being given to the construction of new and more modern houses along the routes traversed, especially the Avenida connecting the city with the seashore at the Barra and St. Vicente. There could be no doubt, in his mind, but that, during the next few years, the progress of the State of San Paulo, generally, and of the seaport of Santos in particular, would be even more rapid than it had been in the past. During the whole year negotiations were proceeding with the Camara as to a definite contract for the electrification of the rest of the system of tramways, resulting in the signing of a contract for a period of 40 years from January 14th last, the date of the signature of the provisional contract by the representative in Santos, and which was ratified by the shareholders at an extraordinary general meeting on March 10th last. At the same meeting a resolution was passed creating a further 20,000 ordinary shares for the purpose of providing part of the expenditure of £220,000 or thereabouts, the estimated cost of electrifying the tramways and matters incidental thereto. Ever since the signing of the contract the directors had been pushing forward the shipment of material with all speed. Mr. Dawbarn, a member of the firm of Messrs. Mordey and Dawbarn, their consulting engineers, with an assistant engineer, left for Santos on March 31st in order to start the works, and to come to a perfect understanding on all engineering points with their resident engineer, Mr. H. M. Sayers, under whose immediate superintendence the works would be carried out, so that with the experience gained on the transformation of the 15 miles already electrified, they had every hope that the work would be executed without a hitch.

Singapore Electric Tramways Co., Ltd.—The directors' report for the year ended December 31st, 1910, states that there was an excess of revenue over expenditure of £31,013; after charging debenture interest, depreciation and royalty, there is a profit of £1,843. Tramway revenue shows an increase of £3,622; 268,332 more passengers were carried and 14,502 more car-miles run. The revenue from lighting and power supplies shows an increase of 38 per cent. as compared with 1909, and 126 per cent. as with 1908. There has been a commission of inquiry into the administration of municipal affairs in the Straits Settlements, and in the course of proceedings evidence was given with regard to the working of the municipal electric light supply in Singapore. The board regrets that not only was no representative of this company called to give evidence before the commission, but the evidence which was given was, in some important respects, wanting in accuracy, and the conclusions drawn from that evidence were, therefore, misleading. The company's representatives in Singapore have, however, taken up the matter, both with the Government and the municipality, and, as a result of correspondence, it is now stated that some of the most important of those statements had either been incorrectly reported or misinterpreted. It has always been, and still is, the policy of the company to popularise the employment of electric power and light in Singapore, and the company has always shown itself ready to meet any reasonable proposal for the furtherance of these objects.

West Coast of America Telegraph Co., Ltd.—The directors' report states that the gross receipts for the year to December 31st amounted to £51,216, as against £50,416 in 1909. The working expenses were £39,357, as compared with £39,204 for the previous year. After providing £6,000 for the interest on the 4 per cent. debentures, £800 for the interest on the 4 per cent. income bonds, and £267 for income-tax, there remains a balance of £4,792, plus £613 brought forward, making £5,406. Of this amount £1,000 has been placed to the general reserve fund, and the directors recommend the payment of a dividend of 2½ per cent., free of income-tax, amounting to £2,813, leaving a balance of £1,593 to be carried forward.

The Canary Islands.—The report of the Société de l'Electricite de Las Palmas for the last financial year, shows a profit of £6,184, as against only £4,870 in the previous 12 months.

MARKET QUOTATIONS.

Wednesday, May 10th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a " Nitric	"	22/-	..
a " Oxalic	"	28/-	..
a " Sulphuric	"	5/6	..
a Ammoniac, Sal	"	42/-	..
a Ammonia, Muriate (crystal)	per ton	£29	..
a " "	"	£30	..
a Bleaching powder	"	£5 10	..
a Bisulphide of Carbon	"	£18	..
a Borax	"	£16	..
a Ferro-Silicon (50 %)	"	£12 10	..
a Copper Sulphate	"	£20	..
a Lead, Nitrate	"	£25	..
a " White Sugar	"	£22 15	..
a " Peroxide	"	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	8½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a " Chlorate	per lb.	8½d.	..
a " Perchlorate	"	4½d.	..
a Potassium, Cyanide	"	9d.	..
a Shellac	per cwt.	75/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	"	£6 10	..
a " Recovered	"	£5 10	..
a " Lump	"	£5 5	5/- inc.
a Soda, Caustic (white 70 %)	"	£11	..
a " Chlorate	per lb.	8½d.	..
a " Crystals	per ton	£8 5	..
a Sodium Bichromate, casks	per lb.	8d.	..
a " Cyanide (basis 100 %)	"	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£75	..
b " Wire, in ton lots	"	£102	..
b " Sheet, in ton lots	"	£120	..
p Babbitt's metal ingots	"	£38 to £145	..
c Brass (rolled metal 2" to 12" basis	per lb.	6¼d.	..
c " Tube (brazed)	"	8½d.	..
c " " (solid drawn)	"	6½d.	..
c " Wire, basis	"	6½d.	..
c Copper Tubes (brazed)	"	8½d.	..
c " " (solid drawn	"	8½d.	..
g " Bars (best selected)	per ton	£69	£1 dec.
g " Sheet	"	£69	£1 dec.
g " Rod	"	£69	£1 dec.
e " (Electrolytic) Bars	"	£56 10	..
e " " Sheets	"	£72 5	..
e " " Rod	"	£69 15	..
e " " H.C. Wire	per lb.	7 7/8d.	..
f Ebonite Rod	"	6/-	..
f " Sheet	"	5/6	..
g German Silver Wire	"	1/11	..
h Gutta-percha, fine	"	8/6	..
h India-rubber, Para fine	"	4/11	4d. dec.
i Iron Pig (Cleveland warrants)	per ton	45/9	10d. dec.
l " Wire, galv. No. 8, P.O. qual.	"	£14	..
g Lead, English Ingot	"	£13 2 6 to £13 10 6	3/- inc.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£9	5/- dec.
d Mica (in original cases) small	per lb.	6d. to 2s.	..
d " " " medium	"	2/6 to 4/-	..
d " " " large	"	4/6 to 8/6	..
p Phosphor Bronze, plain castings	"	11d.	..
p " " rolled bars & rods	"	1/0½	..
p " " rolled strip & sheet	"	1/1	..
o Platinum	per oz.	166/6	..
e Silicium Bronze Wire	per lb.	8 7/16d.	..
r Steel Magnet, in bars	per ton	£66	..
g Tin, Block (English)	"	£192 to £193	£2 dec.
n " Wire, Nos. 1 to 16	per lb.	2/3	..
p White Anti-friction Metals	per ton	£45 to £150	..
k Zinc, Sh's (Vieille Montagne bnd.)	"	£29	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Arc Works Conversazione.—The Arc Works Engineering Society held their annual general meeting and conversazione at the Works Club House, on Friday, May 3rd. This annual gathering closes the session, and the Committee's report showed that the Society has had a very successful year, papers and addresses having been contributed by Dr. S. P. Thompson, Mr. Hobart, Mr. Kenelm Edgecumbe, Mr. E. A. N. Pochin and others. Premiums are awarded for the best contributions from pupils and apprentices and these were presented during the evening by Col. Crompton. In the pupils' class Mr. E. A. Boyd and Lieut. M. Ichsan, of the Turkish Navy, were bracketed for a first place, and in the apprentices' class Messrs. Hughes and Trounson also made level running for a first place. The conversazione followed the general meeting, the entertainment consisting of music with a long interval devoted to pleasant talk, refreshments, and exhibits and experiments of scientific interest. Altogether a very enjoyable evening was spent, and a vote of thanks was passed by acclamation to those who had contributed to the success of the entertainment.

STOCKS AND SHARES.

Tuesday Evening.

CONFLICTING political news from various parts of the world have combined, with a little domestic trouble, to upset, to some extent, the Stock Exchange markets. However, there is a fair amount of investment business going on in a quiet way, and prices are by no means bad as regards the best-class securities. Where falls have taken place they have mostly come in such stocks and shares as attracted a good deal of speculative buying last month, and which have been thrown out by profit-takers in consequence of the depression prevailing in other departments.

The Home Railway market is still the sport of speculation, instead of being the home of investment. Early in the week came a pronounced fall in most of the popular stocks, and its partial recovery still leaves prices considerably down in some cases on the week. Metropolitans and Districts both suffered, the former rather severely, and there was a slump in East London stocks, which affected the Debenture issues as well as the Ordinary. On the other hand, District prior lien stock rose to 2, and there has been a little improvement in the bonds of the Underground Electric Railways, a demand arising for the 6 per cent. income and the 4½ per cent. issues. Central London Ordinary and Deferred are a little better, while City and South London eased off to a slight extent. The gamble in Brighton Deferred has caused the stock to vary between 110 and 107¾ since last week, and there seem to be a fair number of buyers at the lower level.

In the Home Traction group, British Electric Ordinary and Preference have both given way, and so have the Preference shares and the Debenture stock of the London United Tramways. These falls are linked to the heavy drop which has overtaken London General Omnibus stock, by reason of the approach of a probable competitor hailing from the Midlands. 'Bus stock dropped from 125 to 80 within a few days, and this dramatic fall has shaken the nerves of holders of other companies which are engaged in a similar sort of business, the subsequent recovery to 103 not spreading to electrical issues.

Mexico has been a very present thorn in the side of the Stock Exchange. One day peace is concluded, and on the next it is again broken, so that nobody quite knows what the next hour is going to bring forth. Mexican Light and Power stocks have fallen heavily, the Common showing a drop of about 4½, while the Preference and the Bonds are both lower. Other issues in this group are, however, fairly well maintained, and reference to the price list will show that there are small rises in one or two cases. Rio Trams have dropped a point, but the Bonds, curiously enough, are both ¼ better, and a similar fraction has been gained by Sao Paulo Trams 5 per cent. Debenture. The Mexico Tramways varieties are naturally weaker, although there has been a quiet demand for the Bonds on any marked decline.

Anglo-Argentine Trams are not quite so good, except as regards the two Debenture stocks, both of which show rises upon attention being called to the security in various channels. British Columbia Deferred gained a point, and the 4½ per cent. Debenture is also a little better. Calcutta shares rose ½. Manila Electric Railroad and Lighting shares hardened to 85½, upon the issue of a decidedly good report.

The Telegraph market has been considerably agitated over the strange case of the Anglo-American Company. Between it, the American companies and the Government, there has arisen perplexity thrice confounded, and the obscurity of the position led to declines in all the Anglo stocks. American Telephone and Telegraph capital stock has advanced, however, and Western Union 4 per cent. "A" bonds are a couple of points better—clear indications of the way in which the market regards the probable course of negotiations. Direct United Cable shares fell ½, which is another significant movement. The report of the Submarine Cables Trust shows that the company has sold £15,800 Anglo "B" out of its previous holding of £62,000.

Although West India and Panama Preference shares of both classes are ½ higher, the Ordinary show a fall on the week. This is due simply to the investor being stronger, for the time, than the speculator, and points the remarks in the first paragraph above. The Ordinary have been a favourite gambling counter, and in the general fall which overtook the speculative shares all round the Stock Exchange, they had to participate.

For much the same reason National Telephone Deferred has had to endure a sharp fall. There is a bull account none too strong, and with the market more or less restricted, the effort of sellers to get out of their commitments caused the price to drop abruptly. With this there came a fall of ⅛ in the Third Preference shares as well, the bulls having been active in these also.

Babcock & Wilcox shares have given way, but other manufacturing descriptions keep very steady. Arons are better, and British Westinghouse Preference have improved. Marconi Wireless are in more favour, and the system is said to be rapidly developing. Rubber shares have been weak on another fall in the price of the commodity.

Auckland Electric Tramways Co., Ltd.—The directors have declared an interim dividend at the rate of 6 per cent. per annum, less income-tax, on the ordinary shares for the half-year to December 31st.

SHARE LIST OF ELECTRICAL COMPANIES

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1909.	Dividends for 1910.	Closing Quotations May 9th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bournemouth & Poole, Ord.	10	5½	5½	8¼ — 8⅜	..	6 5 9
Do. 4½ % Pref.	10	4½	4½	9¼ — 9⅜	..	4 12 4
Do. Second 6 % Pref.	10	6	6	10⅝ — 10¾	+ ⅛	5 12 11
Do. 4½ % Deb. Stock	Stock	4½	4½	102 —104	..	4 6 7
Brompton & Kensington, Ord.	5	10	10	7⅛ — 7⅜	..	6 11 2
Do. 7 % Cum. Pref.	5	7	7	7⅛ — 7⅜	..	4 11 10
Central Electric Supply, 4 % Guar. Deb.	100	4	4	99 —103	..	3 17 8
Charing Cross, West End & City	5	5	5	3⅞ — 4⅛	— ⅛	5 14 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜	..	4 17 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4⅛	..	5 2 10
Do. Do. 4 % Deb.	100	4	4	96 — 98	..	4 1 8
Chelsea, Ord.	5	4¼	5	4 — 4½	..	5 11 1
Do. 4½ % Deb.	Stock	4½	4½	100 —102	..	4 8 3
City of London, Ord.	10	7	7	11½ — 12	..	5 16 8
Do. 6 % Cum. Pref.	10	6	6	12 — 13	..	4 12 4
Do. 5 % Deb.	Stock	5	5	119 —123	..	4 1 4
Do. 4½ % Second Deb.	100	4½	4½	101 —104	..	4 6 7
County of Durham, 5 % First Mort. Deb.	Stock	5	5	92 — 94	..	5 6 5
County of London, Ord.	10	5	5	7⅜ — 8⅛	..	6 3 1
Do. 6 % Pref.	10	6	6	10⅝ — 11⅜	..	5 7 5
Do. 4½ % Deb.	Stock	4½	4½	109⅜ —111⅜	..	4 0 9
Do. 4½ % Second Deb.	Stock	4½	4½	99 —102	..	4 8 3
Edmundson's, Ord.	5	Nil	Nil	⅜ — 1	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	3⅛ — 3⅞	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	86 — 89	..	5 1 2
Folkestone	5	5½	6	4⅜ — 4⅝	..	6 9 9
Do. 5 % Cum. Pref.	5	5	5	4⅜ — 5¼	..	4 15 3
Do. 4½ % First Deb.	100	4½	4½	97 —100	..	4 10 0
Hove	5	8½	9½	6¾ — 7¼	+ ⅛	6 11 0
Kensington & Knightsbridge, Ord	5	8	9	7 — 7⅜	..	6 2 0
Do. 4 % Deb.	Stock	4	4	93 — 95	..	4 4 3
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	3	2	2	1⅜ — 2⅛	..	2 16 5
Do. 6 % Pref.	5	6	6	4⅜ — 5⅛	..	5 17 1
Do. 4 % First Mort. Deb.	Stock	4	4	91 — 94	..	4 5 1
Metropolitan	5	5	5	3⅞ — 4⅛	..	5 14 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4¼	..	4 16 0
Do. 4½ % First Mort. Deb.	Stock	4½	4½	101 —104	..	4 6 7
Do. 3½ % Mort. Deb.	Stock	3½	3½	86 — 89	..	3 18 8
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	97 — 99	..	4 10 11
Newcastle-on-Tyne	5	4	4	3⅞ — 4⅛	..	4 14 2
Do. 5 % Pref., Non. Cum.	5	5	5	4 — 4⅜	..	5 11 1
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	95 — 97	..	5 3 1
Notting Hill	10	7½	8	12 — 12⅜	..	6 5 6
Oxford	5	7	7½	6 — 6⅜	..	5 11 6
St. James' and Pall Mall, Ord.	5	10	10	8⅜ — 9⅛	..	5 8 1
Do. 7 % Pref.	5	7	7	6¾ — 7¼	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	86 — 88	..	3 19 7
Smithfield Markets, Ord.	5	Nil	Nil	1⅜ — 1⅞	..	Nil
South London, Ord.	4	5	5	3 — 3¼	..	6 3 1
Do. 5 % First Mort. Deb.	100	5	5	101 —104	..	4 16 2
South Metropolitan, 7 % Pref.	1	7	7	1 1/16 — 1 3/16	..	5 17 11
Do. 4½ % First Deb. Stock	100	4½	4½	95 — 98	..	4 11 10
Urban, Ord.	5	5	3½	⅜ — 1½	..	15 0 0
Do. 5 % Cum. Pref.	5	5	3½	2⅜ — 3	..	6 5 5
Do. 4½ % First Mort. Deb.	100	4½	4½	86 — 88	..	5 2 3
Westminster, Ord.	5	10	10	8 — 8½	..	5 17 8
Do. 4½ % Cum. Pref.	5	4½	4½	5 — 5⅛	..	4 3 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅜ — 5⅞	..	5 2 2
Calcutta, Ord.	5	8	7†	6¾ — 7⅛	+ ⅛	5 8 6
Do. 5 % Pref.	5	5	5	4⅜ — 5⅛	..	4 13 0
Calgary Power, 1st Mort. Bds.	100	5	5	96 — 98	+ ½	5 2 0
Canadian Gen. El. Com.	$100	6	6	114 —117	..	5 2 7
Do. 7 % Pref.	$100	7	7	120 —123	+1	5 13 10
Cordoba Lt., Power and T., Ord.	1	..	6	1⅛ — 1 5/16	..	6 8 0
Do. 5 % Deb.	100	5	5	91 — 93	..	5 7 6
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	..	6	97½ — 99½	+1½	6 0 7
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	87 — 90	..	5 11 1
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	84½ — 86½	— ½	5 15 7
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	Nil	1/16 — 3/16	..	..
Do. 6 % Pref.	1	6	6	15/16 — 31/32	..	8 6 8
Kaministiquia Power, 5 % G. Bs.	$500	5	5	103 —105	+1	4 15 3
Madras, Ord.	5	Nil	Nil	3 — 3½	..	..
Melbourne, 6 % Pref.	100	Nil	Nil	36 — 41	..	..
Do. 5 % 1st Mort. Deb.	100	5	5	94 — 96	..	5 4 9
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	89½ — 90½	..	5 11 1
Mexican Lt. & Power, Common	$100	4	4†	81½ — 83½	—1½	4 10 11
Do. 7 % Cum. Pref.	$100	7	7	105½ — 108½	—2	6 7 10
Do. 5 % 1st Mort. Gold Bds.	..	5	5	94½ — 95½	— ½	5 4 9
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	89½ — 91½	..	5 9 3
Montreal, Lt., H. and Power	$100	..	8	153 —156	..	5 2 7
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5	71 — 73	..	6 17 0
River Plate, Ord.	Stock	9	10	228 —238	..	4 4 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	110 —117	..	5 2 7
Do. 5 % Deb. Stock	Do.	5	5	104 —106	..	4 15 3
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital	$100	5	5	115 —118	..	4 4 9
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	108½ —110½	..	4 11 4
Do. 4½ % Per. Deb.	Stock	4½	4½	104 —106	..	4 4 11
Toronto Power, 4½ % Deb.	Do.	4½	4½	101 —103	..	4 8 3
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92 — 94	+1	5 7 6
Victoria Falls Power, Pref.	1	Nil	Nil	3½ — 1 7/32	+ 3/32	Nil
Do. (new)	1	..	Nil	1/8 — 15/32	..	Nil
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	..	6	108 —110	+1	5 9 1

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	Nil	7½ — 7⅞	..	Nil.
Do. 5 % Deb. Red.	Stock	5	5	98 —100	..	5 0 0
American Telep. & Teleg., Cap.	$100	8	8	151½ —153½	+1½	5 4 3
Do. Collat. Trust	$1000	4	4	93¾ — 95⅞	..	4 4 3
Anglo-American Telegraph	Stock	3⅜	3⅜	69½ — 71½	—1½	5 4 11
Do. 6 % Pref.	Do.	6	6	114 —115	—2	5 4 4
Do. Def.	Do.	25/-	30/-	26½ — 27	—1½	5 11 1
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	101 —103	—1	4 17 1
Chili Telephone	5	8	..	7 1/16 — 7 1/8	..	5 11 11
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	88 — 90	..	4 8 11
Cuba Telegraph	10	6	6	9¾ — 10½	..	5 14 3
Do. 10 % Pref.	10	10	10	17½ — 18½	..	5 8 1
Direct Spanish Telegraph, Ord.	5	4	4	3⅞ — 4	..	5 0 0
Do. 10 % Cum. Pref.	5	10	10	8¾ — 8⅞	..	5 14 3
Do. 4½ % Debs.	50	4½	4½	100½ —102½	..	4 8 8
Direct United States Cable	10	4	5	7¾ — 7¾	— ⅛	6 7 0
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	100 —102	..	4 9 1
Eastern Telegraph, Ord. Stock	Stock	7	7	137 —140	..	5 0 0
Do. 3½ % Pref. Stock	Do.	3½	3½	84½ — 86½	+ ½	4 0 11
Do. 4 % Mort. Deb.	Do.	4	4	100 —102	— ½	3 18 5
Eastern Extension	10	7	7	13⅜ — 13⅞	..	5 0 9
Do. 4 % Deb.	Stock	4	4	100 —102	..	3 18 5
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	99½ —101½	..	3 18 10
Globe Telegraph and Trust	10	5⅞	5⅞	11 — 11½	+ ½	5 2 2
Do. 6 % Pref.	10	6	6	13 — 13¾	..	4 9 9
Great Northern Telegraph	10	18	18	32 — 33	+ ⅜	5 9 1
Indo-European Telegraph	25	13	13	59 — 61	..	5 12 0
Mackay Companies Common	$100	4½	5	93 — 96	..	5 3 1
Do. 4 % Cum. Pref.	$100	4	4	78 — 80	..	5 0 0
Marconi's Wireless Telegraph	1	Nil	Nil	1 3/16 — 1 5/16	+ 1/16	Nil.
Monte Video Telephone, Ord.	1	6	6	7/16 — 1	..	6 0 0
Do. 5 % Pref.	1	5	5	⅜ — ¾	..	5 10 4
National Telephone, Pref.	Stock	6	6	104½ —105½	..	5 14 0
Do. Def.	Do.	6	6	129½ —131½	—5½	4 11 3
Do. 6 % Cum. 1st Pref.	10	6	6	10 — 10⅜	..	5 11 7
Do. 6 % Cum. 2nd Pref.	10	6	6	10¼ — 11	..	5 9 1
Do. 5 % Non-cum. 3rd Pref.	5	5	5	5⅛ — 5⅜	— 1/16	4 11 11
Do. 3½ % Deb.	Stock	3½	3½	99 —101	..	3 10 0
Do. 4 % Deb.	Do	4	4	99 —101	..	3 19 2
New York Telep., 4½% Gen. Bnds.	100	4½	4½	98½ — 99½	..	4 9 1
Oriental Telep. and Elec.	1	8	6†	1 1/16 — 1 1/8	..	4 8 3
Do. 6 % Cum. Pref.	1	6	6	1⅛ — 1⅛	— 1/16	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	87½ — 88½	+ ½	4 10 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	100 —102	..	3 18 5
Reuter's	8	5	5	8 — 8½	..	4 13 11
Submarine Cables Trust	Cert.	6	6	131 —134	..	4 9 7
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99½ —101½	..	4 8 8
United River Plate Telephone	5	8	6†	7⅜ — 7⅞	..	5 3 3
Do. 5 % Cum. Pref.	5	5	5	5⅛ — 5⅜	— ⅛	4 8 11
West Coast of America	2½	2½	..	1¼ — 1½	..	..
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	99½ —101½	..	3 18 10
West India and Panama Teleg.	10	Nil	½	2⅜ — 2⅝	— ⅛	1 18 1
Do. 6 % Cum. 1st Pref.	10	6	6	10⅜ — 10⅝	+ ⅛	5 10 4
Do. 6 % Cum. 2nd Pref.	10	14½	..	9½ — 10	+ ⅛	6 0 0
Do. 5 % Debs.	100	5	5	102 —104	..	4 16 2
Western Telegraph, Ltd.	10	7	7	13½ — 14	..	4 19 1
Do. 4 % Deb.	Stock	4	4	101 —103	..	3 18 10
Western Union Tel., 4% Bnds. A	$1000	4	4	105 —108	+2	3 14 1
Do. 4½ % Fdg. Bonds	$1000	4½	4½	98 —101	..	4 8 3

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for		Closing Quotations May 9th.	Rise + or Fall —	Present Yield p.c.
	*	1909.	1910.			£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	⅛ — ⅜	..	Nil
Do. 5 % Pref.	1	5	5	⅜ — ⅝	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	79 — 83	..	5 8 5
Brit. Elec. Trac., Ord.	10	Nil	Nil	1¼ — 1⅝	— ¼	Nil
Do. 6 % Pref.	10	3	..	4⅜ — 4⅞	— ¼	Nil
Do. 5 % Deb.	100	5	5	94 — 98	..	5 2 0
Do. 4½ % 2nd Deb.	100	4½	4½	75 — 80	..	5 12 6
Central London Railway, Ord.	100	3	3	75 — 77	+1	3 17 11
Do. Pref.	100	4	4	87 — 89	..	4 9 11
Do. Def.	100	2	2	65 — 67	+1	2 19 8
Do. 4 % Deb.	100	4	4	102 —104	..	3 16 11
City & South London, Ord.	100	1⅜	1½	34 — 35	— ½	4 5 9
Do. 5 % Pref., 1891	100	5	5	109 —111	..	4 10 1
Do. Do. 1896	100	5	5	104 —106	..	4 14 4
Do. Do. 1901	100	5	5	101 —104	..	4 16 2
Do. Do. 1903	100	5	5	102 —105	+1	4 15 3
Do. 4 % Deb.	100	4	4	100 —102	..	3 18 5
Dublin United Trams, 6 % Pref.	10	6	6	12¼ — 13½	..	4 10 7
Great Northern & City, Pr'f. Ord	10	Nil	Nil	1⅜ — 1⅝	..	Nil
Hastings Trams, 6 % Pref.	5	Nil	Nil	1½ — 2	..	Nil
Do. 4½ % Deb.	100	4½	4½	75 — 80	..	5 12 6
Isle of Thanet Trams, 5 % Pref.	5	1½	2½	2 — 2⅜	..	5 5 3
Do. 4 % Deb.	100	4	4	79 — 84	..	4 15 3
Lancashire United, 5 % Deb.	100	5	5	82 — 84	..	5 19 1
London Elec. Railw'ys, 4 % Deb.	100	4	4	97 — 99	..	4 0 10
London United Trams, 5 % Pref.	10	Nil	Nil	2¾ — 3	— ⅛	Nil
Do. 4 % Deb.	100	4	4	75 — 78	+1	5 2 7
Metropolitan Railway Consol.	100	1	1⅜	50¾ — 51¼	—1½	2 13 7
Do. Surplus Lands	100	2¾	2¾	66 — 68	..	4 0 11
Do. 3½ % Deb.	100	3½	3½	93 — 95	..	3 13 8
Do. 3½ % Pref.	100	3½	3½	90 — 92	..	3 16 1
Do. 3½ % Con. Pref.	100	3½	3½	89 — 91	..	3 16 11
Metropolitan District Ord.	100	Nil	Nil	32 — 32¼	—1½	Nil
Do. 6 % Deb.	100	6	6	148 —150	..	4 0 0
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
Do. 4 % Prior Lien	100	4	4	102 —104	+2	3 16 11
Do. 4½ % First Pref.	100	..	3½	88 — 90	..	3 12 3
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metropolitan Elec. Trams, Ord.	1	5	5½	1⅜ — 1⅝	..	5 17 4
Do. Def.	1	Nil	Nil	3/16 — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	⅞ — 1	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	102 —104	..	4 6 7
Do. 5 % Deb.	100	5	5	99½—101½	..	4 18 6
Potteries, Ord.	1	2	..	1/16 — 3/16	..	..
Do. 5 % Pref.	1	5	5	⅜ — ⅝	..	6 19 2
Do. 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
South Metro. Trams, 6 % Pref.	1	3	..	1/32 — 3/32	..	..
Do. 4 % Deb.	100	4	4	75 — 80	..	5 0 0
Underground Elec. Railways 5 % Prior Lien	..	5	5	100 —101	..	4 19 0
Do. 4½ % Bonds	100	4½	4½	98 — 99	..	4 10 11
Do. 6 % Income	100	Nil	10/-	58 — 60	+1	0 16 8
Do. Power House Debs.	100	..	4	99 —101	..	3 19 3
Yorkshire (West Riding), Ord.	5	Nil	Nil	¼ — ⅜	..	Nil
Do. 6 % Pref.	5	Nil	Nil	2⅛ — 2⅜	..	..
Do. 4½ % Deb.	100	4½	4½	84 — 87	..	5 3 6

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5	5 — 5⅛	— 1/16	4 15 3
Do. 2nd Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. 4 % Deb.	100	4	4	92 — 93½	..	4 5 7
Do. 4½ % Deb.	100	4½	4½	100 —102	+ 1/2	4 8 3
Do. 5 % Deb.	100	5	5	102½—104½	+ ½	4 15 8
Auckland Trams, 5 % Deb.	100	5	5	104½—106½	..	4 13 11
Bombay Elec. S. & Trams, Pref.	10	6	6	10¾ — 11¼	..	5 6 8
Do. 4½ % Deb.	100	4½	4½	96⅞ — 98⅜	..	4 11 5
Do. 5 % 2nd Deb.	100	5	5	97 — 99	..	5 1 0
Brisbane Trams Invt., Ord.	5	8½	8†	6⅜ — 6⅝	— 1/8	6 12 0
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	+ ⅛	4 15 3
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
B. Columbia Elec. Rly., Def.	100	8	8	146 —150	..	5 6 8
Do. Pref. Ord.	100	6	6	125 —128	+1	4 14 6
Do. 5 % Pref.	100	5	5	107½—110½	..	4 10 6
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —103	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	102 —105	..	4 5 9
Do. 4½ % Con. Deb.	100	4½	4½	101 —103	+ ⅛	4 13 9
Calcutta Trams, Ord.	5	4½	5	5⅜ — 5⅝	+ ⅛	4 11 11
Do. 5 % Pref.	5	5	5	5⅛ — 5⅜	..	4 13 0
Do. 4½ % Deb.	100	4½	4½	101 —104	+3	4 6 7
Cape Electric Trams	1	Nil	Nil	7/16 — 9/16	..	Nil
City Buenos Aires Trams (1904)	5	5	5	5⅜ — 5⅝	..	4 5 1
Do. 4 % Deb.	100	5	5	98 —101	..	4 19 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	95 —98	..	5 2 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	99½—101½	..	4 18 6
Kalgoorlie Elec. Trams	1	Nil	Nil	3/8 — 5/8	..	Nil
Do. 5 % A Deb.	100	5	5	94 — 97	..	5 3 1
Do. 6 % B Deb.	100	6	5	66 — 70	..	7 2 10
La Plata Elec. Trms, Prf, 17/6 pd.	1	6	6	13/16 — 15/16	..	6 8 0
Lisbon Elec. Trams, Ord.	1	6	6	1 — 1⅛	..	4 16 0
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	98 —102	..	4 18 0
Madras Elec. Tr. (1904), Deb.	100	5	5	96 — 98	..	5 2 0
Manaos Trams & Lt., 1st Deb.	100	..	5	92½ — 94½	..	5 5 10
Manila Elec. R. and Ltg., Bonds	$1000	5	5	99½—101½	+ ½	4 18 6
Mexico Trams Com.	$100	6	7	122 —125	—1½	5 12 0
Do. Gen. Con. 5 % Bonds	..	5	5	96½ — 97½	— ½	5 2 7
Do. 6 % Bonds	100	6	6	101½—102½	— ½	5 17 1
Para Elec. Rlys. & Lt., Ord.	5	..	10	7⅜ — 7⅝	— 1/16	6 14 5
Do. 6 % Pref.	5	6	6	5⅜ — 5⅝	..	5 2 2
Do. 5 % 1st Deb.	100	5	5	102 —104	..	4 16 2
Perth (W.A.) Elec. Tr., Ord.	1	2½	..	1/16 — 1/8	..	2 13 4
Do. 5 % 1st. Deb.	100	5	5	104 —106	..	4 14 4
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅜ — 5⅝	..	5 4 4
Do. 4½ % 1st Deb.	100	4½	4½	99 —102	..	4 8 3
Rio de Janeiro Trams	$100	2	5	108 —109	—1	4 11 9
Do. 1st Mort. 5 % Bonds	..	5	5	102⅜—103⅜	+ ⅛	4 16 7
Do. 5 % Mort. Bonds	100	5	5	95¼ — 96¼	+ ¼	5 3 11
Sao Paulo Tram, Lt. and P.	$100	10	10	168 —170	..	5 17 8
Do. 5 % 1st Deb.	$500	5	5	103½—104½	+ ½	4 15 8
Singapore Trams, 5 % Deb.	100	5	5	82 — 86	..	5 16 3
Southern El. Tr. B.A., 5 % Deb.	..	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video	5	7	6†	6 — 6⅛	..	5 7 8
Do. 6 % Pref.	5	6	5	5½ — 5⅝	— 1/8	4 10 11
Do. 5 % 1st Deb.	100	5	6	101 —104	..	5 15 5
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	104 —106	..	4 4 11

MANUFACTURING COMPANIES.

Aron, Ord.	1	..	..	9/16 — 11/16	+ 1/32	..
Do. 6 % Pref.	1	12	9	11/16 — 13/16	..	7 2 0
Babcock & Wilcox	1	24	20†	5⅞ — 6⅛	— ⅛	4 7 3
Do. Pref.	1	6	6	1⅜ — 1⅝	..	4 0 0
B.I. & Helsby Cables	5	10	10	6⅞ — 7⅛	..	6 15 7
Do. Pref.	5	6	6	5⅞ — 6⅛	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	96 — 99	..	4 10 11
British Westinghouse, Pref.	3	Nil	Nil	1/16 — 2/16	— 1/32	Nil
Do. Deb.	100	4	4	61 — 64	+1	6 5 0
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	1	Nil	Nil	1/16 — 1/8	..	Nil
Do. Pref.	1	Nil	Nil	14/6—15/6	..	Nil
Brush, Ord.	2	Nil	Nil	1/16 — 3/16	..	Nil
Do. 7 % Pref.	2	Nil	Nil	⅛ — ⅜	..	Nil
Do. 4½ % Deb.	100	4½	4½	59 — 64	..	7 0 8
Do. 4½ % Second Deb.	100	4½	4½	41 — 46	..	9 15 7
Callender's Cable	5	15	10†	9⅞ — 9¾	..	7 13 5
Do. Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
Castner-Kellner	1	17½	..	3/16 — 3/32	..	4 18 3
Do. Deb.	100	4½	4½	103 —106	..	4 4 11
Crompton & Co.	3	Nil	Nil	⅛ — ⅜	..	Nil
Do. Deb.	100	5	5	70 — 80	..	6 5 0
Dick, Kerr	1	5	6	⅞ — 1	..	6 0 0
Do. Pref.	1	6	6	1 — 1⅛	..	5 6 8
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Edison & Swan, A, £3 paid	5	Nil	Nil	1/2 — 5/8	..	Nil
Do. fully paid	5	Nil	Nil	1⅛ — 2⅜	..	Nil
Do. 4 % Deb.	100	4	4	69 — 73	..	5 9 7
Do. 5 % Second Deb.	100	5	5	78 — 81	..	6 3 5
Electric Construction	2	Nil	Nil	3/32 — 1	..	Nil
Do. Pref.	2	7	7	1⅜ — 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	10¼ — 10⅜	..	6 10 3
Do. Deb.	100	5	5	102 —103⅜	..	4 16 7
General Electric, Pref.	10	5	5	8¼ — 8⅜	..	5 14 3
Do. Deb.	100	4	4	83 — 88	..	4 10 11
Henley's, Ord.	5	15	15	12⅛ — 12⅝	..	5 16 6
Do. Pref.	5	4½	4½	4⅛ — 5/16	..	4 6 9
Do. Deb.	100	4½	4½	108 —110	..	4 1 10
India-Rubber, G. & T.	10	10	10	16½ — 17	..	5 17 8
Do. Pref.	10	5	5	10¼ — 10⅝	..	4 14 1
Telegraph Construction	12	17½	20	36½ — 38½	..	6 5 9
Do. Deb.	100	4	4	100 —102	..	3 18 5
Willans & Robinson	1	Nil	Nil	⅛ — ⅜	..	Nil
Do. Pref.	5	3	Nil	½ — 1	..	Nil
Do. Deb.	100	4	4	55 — 65	..	6 3 1

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 3 per cent., March 9th, 1911.

STATION SUPERINTENDENTS.

[COMMUNICATED.]

When a shift engineer develops into a station superintendent, he is not long in discovering that the job is less rosy than it used to appear, and what he would give to be a chief there is no telling. It is true that under normal conditions his hours are regular, his meals are taken at ordinary times, his pay is a little more, and his duties less monotonous, but for all this, his life is not necessarily happy. Perhaps he is called upon to reside in close proximity to the station, and his apartments may be situated in a somewhat uncomfortable spot where the noise of the machinery can always be heard, and the odour from a dust destructor is prevalent. Possibly he may have to live by a canal or a dirty and evil-smelling river, or in some equally distasteful locality where few save the most unnatural of people would care to reside. Added to such discomforts, he will probably find that he is expected to put in an appearance at the station during part of the evening, so after all his new position has not brought him a glorious existence, or even a normal and healthy life. It is just possible that one of his ambitions is to marry, and that he has done all in his power to secure a better position on that account, but this is impossible whilst he is bound to such objectionable surroundings, and so it happens that he is deprived of having a wife.

With luck a man may secure a station superintendent's position at a healthy seaside resort, or in some picturesque city or town, but his salary will most certainly suffer in consequence. To secure a respectable income as a station superintendent it is necessary to enter a station situated in a large and busy city or manufacturing district where the load is heavy and plenty of worry is to be found. The responsibilities which fall upon the station superintendent's shoulders are then far greater than those of a shift engineer, and on rising to the former position, a shift man discovers many new things. Chief of all he soon finds that it is far easier to report a breakdown in the log book than it is to get the damage repaired. Another thing he will quickly learn, is that he has constantly to keep his eye on the works costs, and if these tend to show an increase, he is likely to fall out with his chief. Then there are the men. It is true that when he was a shift engineer a certain section of these came under his control, but possibly he was then only one dealing with engine-drivers, stokers and cleaners, who are usually more easily handled than men skilled in some particular art. Fitters as a rule are rather more awkward to manage than the members of the running staff, and so surely as they find that a station superintendent is at all lacking in practical experience, then the job of getting them to perform their work properly is not an easy task. It is simple to hide ignorance from those devoid of knowledge, but the same obviously cannot be said when one is dealing with a more or less trained staff. An unpractical man may get along fairly well as a shift engineer, but may fail pitifully when he comes to deal with repairs and other matters which demand a sound training and knowledge of engineering craft. No amount of book work will teach a man how a rotor should be lifted out of a turbine casing, or whether the time spent in repacking the tubes of a condenser should amount to days or weeks. Nor will it help him to discover whether boiler tubes have been properly expanded, or what is the cause of a knock in an engine or feed pump. Such things can only be learnt by practical experience, and it is a very unfortunate circumstance if any young man manages to secure an appointment as a station superintendent without having been through the shops. It is unfortunate, not only for himself, but for all others concerned, and particularly for the chief. In some stations, however, an able foreman fitter is kept, and it may happen that this gentleman greatly relieves the station superintendent of responsibility; but in the absence of such assistance, a poorly-trained station superintendent will soon find himself in difficulties, and when he is called upon to resign, it may be necessary to spend a great deal of money on the plant. Fortunately it seldom happens that an unqualified man manages to secure such an appointment, for the chief engineer knows far too well how essential it is to secure a highly efficient engineer to fill this position on the staff. Men of all ages are to be found acting in the capacity of station superintendents. Some are looking forward to becoming chiefs, whilst others cherish no hopes of ever reaching that position, for they realise that their previous careers have scarcely made them the right type of men, and they prefer to remain where they are rather than endeavour to obtain a post which in all probability would not last.

An engineer who has spent most of his time at sea, for example, is not likely to prove a suitable man for a chief, nor is an engineer who has devoted most of his time to shop practice. As a matter of fact, it frequently happens that the best station superintendents would make anything but good chiefs, whilst there are others who are not so efficient as station superintendents who would probably do better in the higher capacity. The best station superintendents are those who love their calling, and who are only really happy when they are in the station and engaged in hard work. It is the man who is always active and constantly seeing what he can do to improve the operating conditions of the plant that proves the best station superintendent. Such men put life into the other members of the staff and gain the respect of all who are connected with the station. To men of this type, the conditions under which they may have to live count for nothing, and if their apartments were situated in one of the most beautiful quarters of the globe they would be no more pleased. They are born engineers, and have been reared in the midst of machinery. Noise, smoke and the smell of oil have no effect upon them, nor even has the high temperature which may prevail in the engine room or boiler house. There are men in the engineering profession who are quite willing to put up with no end of inconveniences and hardships for a certain number of years; this is only done with the hope of gaining a more comfortable existence afterwards. But if many of them were sure that there was no chance of ever freeing themselves from such conditions, it is possible that they would lose no time in disassociating themselves from the engineering profession. Hope is a great thing, and particularly where ambitious engineers are concerned. It is a fortunate circumstance that there are men such as those just described who have no particular wish to reach the top of the tree, and who, in fact, would be less happy if through no particular effort of their own they did happen to get there. Such men are quite safe in taking up central station work as a profession, and with a few exceptions they are really the only individuals who stick at it.

As regards the training and subsequent experience of station superintendents, these vary considerably. Sometimes we find men holding this position who served their time in marine shops and afterwards went to sea. Others started in locomotive shops or with general engineers. Then perhaps they put in a short time with a contracting firm and finally got landed into a central station. A great deal has been said about employing marine men in this capacity, and it has been argued that the average sea-going engineer knows practically nothing about electrical matters. This statement, however, is rapidly becoming less correct; for owing to the ever increasing use of electricity on ships, the rising generation of marine engineers are taking a keen interest in the mysteries of electrical science. But after all, the majority of station superintendents in existence to-day probably know a great deal more about mechanical engineering than they know of electrical matters, and it is right that they should. It is far more desirable that a station superintendent should know how new tubes should be put into boilers than that he should understand the art of winding armatures, and many other similar examples might be given. At the same time, it is obviously essential that his electrical knowledge should be good, otherwise he will frequently find himself in difficulties. The electrical knowledge which a man requires to enable him satisfactorily to take charge of an electric generating plant is frequently very much overestimated, and particularly in the case of alternating-current plants.

Of all things that a station superintendent should possess to enable him properly to perform his duties, nothing is of greater importance than a thoroughly sound constitution. This applies not only to station superintendents, but to all who are engaged in practical engineering, and it is unfortu-

nate that this is not more widely recognised. In delivering a lecture some time ago at the London University College, Prof. Fleming emphasised this point. He said that if he were asked what was the most essential thing a man should possess to enable him to become a successful engineer, he would say—a good constitution; and there is not the least doubt that he is perfectly correct. Young men frequently take up this arduous calling who are totally unfit for the work, with the result that they turn out miserable failures. Only those who have undergone the ordeal of an engineering training and the hard and responsible work which follows it, can appreciate the significance of Prof. Fleming's statement, otherwise we might have fewer would-be engineers in our midst. Possibly if statistics could be published yearly showing the number of young men who cease to follow this profession through their inability to stand the strain, these figures would show some very unexpected results, and they might be the means of preventing so many from choosing an engineering calling.

Many anecdotes might be told about station superintendents, but it must suffice to deal with one touching upon ill-health. Having caught a bad chill, a station superintendent was confined to his rooms, and his condition became so serious that his landlady called in a doctor. One day, as the doctor was leaving the house, he instructed the good woman to take the station superintendent's temperature, with the aid of a thermometer, and to report his condition on the following day. "Well," said the doctor, when he paid his next visit, "how is Mr. Jones now?" "Oh, much better, sir," was the answer; "I put the barometer on his chest and the pointer went round to 'very dry,' so I gave him some beer, and he has gone to work this morning."

THE ECONOMICAL LIGHTING OF SMALL TOWNS BY ELECTRICITY.

By ERNEST H. WRIGHT, A.M.I.E.E.

From a perusal of the technical journals of the past few years, it will be noticed that the number of schemes promoted for the lighting of small towns by electricity in recent times have been few and far between. It might at first sight be considered that this would be due to the fact that the majority of towns were already equipped with generating plant, and that the stagnation of promotion was merely in the natural order of things. On examination, however, it will be found that there is still a large number of towns without any supply of electricity, and it is the purpose of this article to look into the reason for this, and to make certain suggestions which, taken up, would undoubtedly remedy matters.

The first point to be observed is that many provisional orders obtained by local authorities have been allowed to lapse. That, of course, shows that schemes have been considered in the past, and that while there has existed an idea of those towns becoming suppliers of electricity some very good reason has prompted them to abandon it.

The reason is, I think, not a difficult one to suggest; it is an undisputed fact that even many of the larger towns have not been successful from a financial point of view, whilst as regards the smaller towns, at least 50 per cent. are at the present time showing annual losses of a more or less heavy character, due to the fact that at the time their schemes were promoted, generating plant was much more costly than it is to-day, and also that for various reasons they were induced to embark on altogether too ambitious schemes; in other words, their undertakings became at once over-capitalised, and have since landed the ratepayers of their respective towns with heavy and continuous burdens, which will have to be borne for many years. This has no doubt been realised by many would-be promoters, and its effect has been to react on the electric lighting industry in a very detrimental manner.

The mistake of over-capitalisation being realised, however, it should not be a difficult matter to profit by the lesson in future so far as it affects the smaller towns and villages, and it is the writer's confident opinion that the present time is ripe for the development of electric lighting and power schemes for such places, as combined with the lessons of the past, the great improvements that have of late years been introduced in plant, mains and consuming devices, all make for successful operation in the many fields that are at the present time open to electrical enterprise.

The position to-day is that while it is safe to say that everyone would wish to enjoy the benefits of an electricity supply, many difficulties are often experienced by the would-be consumer, especially at any appreciable distance from the larger towns. The tendency of the times is for the ordinary business man to reside further afield; he expects to be able to enjoy the benefits he is able to enjoy in town, and undoubtedly the authorities of the particular town he may select to reside in would, for their own advantage, be only too glad to meet such demand if the idea could be got rid of that it necessitated financial loss.

The purpose of this article is to prove that this is not only possible, but that it would be profitable. Since the disappointing results which have been obtained by the many undertakings already referred to, a new and unquestionably highly economical method of generating electricity has been found in the internal combustion engine, known as the Diesel oil engine, the favourable reports of which have often appeared in the technical papers, and are now being fully borne out by practical experience. Small towns previously equipped with steam plant have actually scrapped almost new machinery for this modern form of engine, with the result that where previously annual losses were incurred, profits are now being made, or a reasonable prospect exists of the same happy result. This remarkable change having been made by the older concerns still heavily burdened with capital; how much more favourable is the position of any town starting an undertaking to-day.

The cost of fuel, once the heaviest item in working costs, has been reduced in many existing stations by as much as 75 per cent., and will now compare favourably with what is obtained in the larger and more successful ones, while the cost of maintenance, stores, &c., is also much reduced. The Diesel oil engine can be placed in the most central position of any town, and the small attention and space it occupies make it an ideal plant for small lighting and power schemes.

Let us take, for example, an average growing town of, say, 5,000 population. With the experience of the past the requirements of such a town are not difficult to estimate, and the probable consumption can also be arrived at by an examination of the records of similar sized towns. The following estimate should amply suffice for the first few years' working:—

Estimated Cost.

Two Diesel engines and generators of 66 KW. and 33 KW. capacity		£2,120
One 500 ampere-hour battery, switchboard, &c.		600
Buildings, land, engineers' fees, cost of order, &c.		800
		£3,520
Add for feeder and distributing mains		2,000
Total capital cost		£5,520
Loan charges on £5,520 at 6½ per cent. =		£358

Working costs for generating, say, 50,000 units:—

	Per unit.	£.
Fuel	·17d.	36
Wages	·96d.	200
Oil, water and stores	·2d.	50
Maintenance	·4d.	100
Management, rates, insurance, &c.	·6d.	150
	2·33d.	£536

Units sold, say, 47,000 at 5d. =		£989
Total working expenses	£536	
„ loan charges	358	894
Profit on first year's working		£95

It will be noticed that the total capital expenditure suggested is only £5,520, and these figures are based on actual experience; it is always an easy matter to extend plant and mains once the undertaking is established on a sound financial basis; but it is not by any means an easy matter to pay interest and sinking fund charges on plant and mains lying idle, of which there are many instances at the present

time. The writer's confident opinion is that any supply commenced on the lines which have been suggested in this article could not fail to be an immediate success, and thereby of advantage to the electric lighting industry generally.

THE MAGNETIC PROPERTIES OF MODERN IRON ALLOYS.

SOME interesting particulars of the improvements effected in the magnetic qualities of iron in recent years are given by Dr. S. Guggenheim in *Elektrische Kraftbetriebe und Bahnen*. He points out that the combined hysteresis and eddy-current loss has steadily decreased. Thus the loss in watts per lb. at a maximum flux density of 10,000 gauss and a frequency of 50 with sheet iron ·02 in. thick was approximately 2·1 in 1893, whilst in 1904 the Bismarkhütte was able to supply iron giving 1·26 watts; in 1905

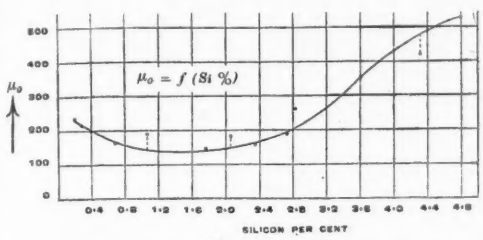


FIG. 1.

Capito and Klein had reduced this to 1·04 watts; in 1906 some of the American irons showed only ·9 watt, whilst in 1908 the best iron of the Bismarkhütte had a loss per lb. of only ·84. This firm at the present time supplies three grades of iron, viz., ordinary sheet having a loss of 1·7 watts per lb. at 50 cycles and B = 10,000, special sheet having a loss of 1·17 watts, and best quality sheet with the above loss of ·84 watt. Occasional batches of the best quality show only ·77 watt.

It is an open secret that these improvements have been effected by the addition of small quantities of silicon and the reduction of all other impurities, including carbon, to a minimum. Great purity alone, without the addition of silicon, considerably improves the quality, but, for the best results, additions of silicon up to 5 per cent. are necessary. The final result depends also to a certain extent on the special thermal treatment used.

It has often been stated that these new alloys have comparatively low permeabilities, and, with a view to investigating this, Dr. Guggenheim had a series of 13 solid sample rings of various iron-silicon alloys made up. The makers (Messrs. A. Oehler & Co., of Aarow), supplied the accurate chemical analysis with each ring.

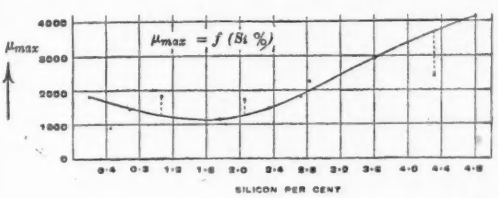


FIG. 2.

The smelting was done in crucibles, so that it was impossible to keep the carbon content below ·2 per cent. In working on a large scale electric furnaces would be used, and the carbon could then be kept below ·1 per cent., and this would be desirable. As regards heat treatment, the rings were kept at 900° C. to 1,000° C. for several hours. They were then cooled to 800° in the furnace in two hours, and the final cooling occupied another 10 hours. Of the 13 rings, two, which contained over 5 per cent. of silicon, were unusable owing to their extreme hardness.

The remaining 11 samples were accurately tested by the well-known ring method, and showed the following results:—

1. The initial permeability, μ_o, first falls with increasing percentages of Si, and then rises again with further increase of Si, as shown in fig. 1.

2. The maximum permeability, μ_{max}, also first falls and then rises again with increasing percentages of Si (see fig. 2).

3. At high induction densities of over 14,000 the permeability for a given magnetising force decreases steadily with increasing percentages of silicon. Up to about 1·8 % Si, the initial slope of the B-H curve gets smaller and smaller, whilst for 1·8 % to 5 % the steepness gets greater and greater. At the same time, the knee of the curve becomes more and more pronounced with these larger percentages of Si, so that at high densities the permeability is actually somewhat lower the higher the percentage of Si. This is indicated in the following table, which shows the comparison of a ring having ·194 % Si with a ring having 4·79 % Si:—

H.	B, with ·194 % Si.	B, with 4·79 % Si.	Percentage change in B referred to the ·194 % sample.
2	2,850	7,620	+ 168 %
5	8,350	11,660	+ 40 %
10	11,490	13,060	+ 14 %
20	13,670	13,860	+ 1·4 %
50	15,580	15,040	− 3·5 %
100	16,950	16,140	− 4·8 %

It is clear that the addition of Si may increase the permeability within the normal working range (up to 13,000 or 14,000) far more than it reduces the permeability at very high densities.

The effect of silicon on the hysteresis loss is shown in fig. 3. Here, again, the curves have definite maxima—the loss increasing until the Si content reaches about 1·8 per cent., and then falling off, at first rapidly, and then more gradually towards 5 per cent.

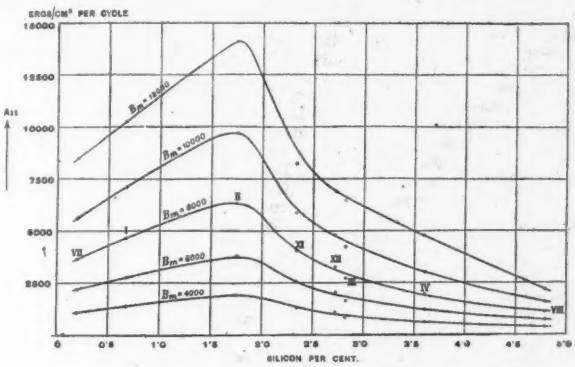


FIG. 3.

From mechanical considerations, as stated above, greater percentages of Si than about 5 per cent. are not permissible. Even with 4·8 per cent., however, this curve shows that the alloy is considerably better than any hitherto obtainable commercially—the loss working out at ·56 watt per lb. for a flux density of 10,000 and a frequency of 50. The material is, of course, very hard, but this was originally also the case with the existing high-grade alloys (containing probably about 3½ per cent. of Si), and was only removed after long-continued careful experiment, so that it is quite possible that some similar form of thermal treatment will enable

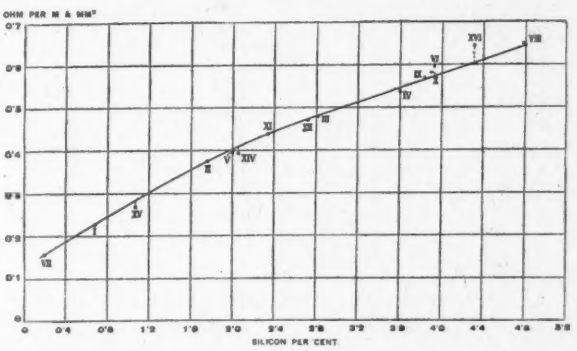


FIG. 4.

this new high-percentage alloy also to be sufficiently softened The effect of the silicon percentage in increasing the specific resistance, and thus reducing the eddy-current loss, is shown in fig. 4. It will be seen that the alloy with 4·8 per cent. Si has about six times as high a specific resistance as ordinary iron. The price of the new alloys has, of course, steadily increased with their quality, partly because of the increased labour involved, and partly because of the high percentage of waste.

The results obtained up to the present may be summarised thus:—

Quality.	Loss in watts per lb. at 10,000 B and 50 ~	Value of B. For H = 10	Value of B. For H = 20	Price in £ per ton.
Ordinary sheet	1·7	12,700	14,200	£10
Special sheet	1·17	13,500	14,800	£16
Best quality commercial alloy	·84	12,700	13,900	£34
New high percentage alloy of Oehler & Co. (4·8 % Si, ·3 % carbon) ...	·56	13,060	13,860	—

PROCEEDINGS OF INSTITUTIONS.

Gas Producers.

By J. E. DOWSON, M.I.Mech.E.

(*Abstract of paper read before the* Institution of Mechanical Engineers, *April 28th*, 1911.)

Speaking generally, producer-gas is made by forcing or drawing air (with or without the addition of steam or water vapour) through a deep bed of fuel in a closed producer; the solid fuel is converted into gas and the latter passes away to wherever it is required. An important characteristic of the process is that no external heat is applied to the producer, as in the case of an ordinary gas retort; when once the burning of the fuel *inside* the producer has been started, the air which is used to make the gas keeps up a continuous process of combustion, and a sufficiently high temperature is maintained to decompose the steam and to effect the other necessary reactions.

If there were a shallow fire in the producer and an abundant supply of air, the carbon and other combustible constituents of the fuel would be completely oxidised, and the products of this complete combustion would be incombustible and useless as a gaseous fuel. If, however, there is a considerable depth of fuel in the producer (as there should always be in practice), there will be an excess of highly heated carbon, and this will react on the carbon dioxide and reduce it to carbon monoxide, thus: $CO_2 + C = 2\,CO$. Carbon monoxide may also be formed by the direct combination of carbon with oxygen, thus: $2\,C + O_2 = 2\,CO$. Actually both these reactions may and probably do occur. It will be seen, therefore, that one of the chief functions of a gas producer is to bring about a partial combustion of the fuel, so that the resulting gas may be combustible.

Theoretically when carbon is converted to carbon monoxide in the producer, about 30 per cent. of the heat of combustion of the carbon is liberated; the remaining 70 per cent. will be liberated when the carbon monoxide is afterwards burnt to carbon dioxide in a furnace, engine, &c.

In furnace work, when the furnace is close to the producer, the loss of sensible heat is small; but when the gas is used for engines or for heating work requiring small cocks and burners, it must be washed and scrubbed, and as this involves cooling there is a considerable loss of sensible heat; moreover, the gas for an engine must necessarily be cool, apart from cleaning, so that a given volume burnt in the cylinder may contain as large a proportion of heat energy as possible.

The addition of water vapour was an important departure. When steam interacts with carbon at a sufficiently high temperature, it is decomposed and an equal volume of hydrogen is produced; the oxygen of the steam combines with the carbon to form either carbon monoxide ($H_2O + C = H_2 + CO$) or carbon dioxide ($2\,H_2O + C = 2\,H_2 + CO_2$), according to the conditions under which the reaction takes place. These reactions cause a large absorption of heat, and the addition of even small quantities of steam to the air supply of a producer reduces the working temperature. Part of the sensible heat is also absorbed, so that the gas leaves the producer at a lower temperature than is the case when air alone is used; the heat so absorbed is stored up in the gas, and is again set free when the gas is burnt. In other words, the effect of the presence of steam in the air supply is that a smaller proportion of the total heat of combustion of the fuel is liberated in the form of sensible heat in the producer, and a larger proportion is represented by the heat of combustion of the gas.

In the author's own producers of steam-jet pressure type (with superheated steam) the average composition of the gas made in eight different sizes of producers has been as follows:—

	Percentage by volume.
Carbon monoxide	25·17
Hydrogen	18·19
Carbon dioxide	5·98
Nitrogen, &c....	49·36

In all these tests the gas was made with anthracite, which yields less hydrogen than bituminous coal. The weight of steam decomposed varied from 0·5 lb. to 0·7 lb. per lb. of fuel gasified.

In the Mond producer, where an excess of steam is used to favour the production of ammonium sulphate, the composition of the gas is as follows:—

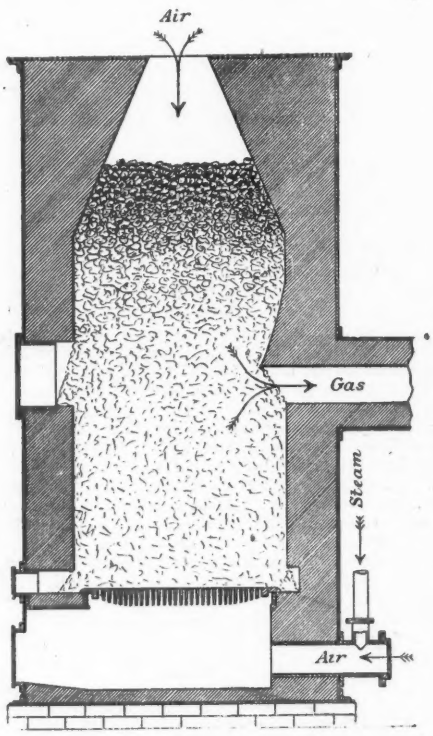
	Percentage by volume.
Carbon monoxide	11
Hydrogen	29
Methane	2
Carbon dioxide	16
Nitrogen	42

In this case the hydrogen has been raised to 29 per cent., but the carbon dioxide has also risen to 16 per cent., and clearly from the heat efficiency point of view too much steam has been used. The weight of steam sent into the producer was over 2 lb. per lb. of fuel gasified.

When the author first used producer-gas to work gas engines, the compression pressures were low compared with those now in use, and it was considered important to have as high a percentage of hydrogen as possible, as it ensured the prompt ignition of the charge in the cylinder. Much higher compressions are now used, chiefly because they raise the heat efficiency of the engine; and as the mixture of gas and air is more highly compressed, it is ignited more readily. It has, therefore, become less important to have a high percentage of hydrogen; in fact, it is now considered by many to be a drawback, as there is then greater risk of pre-ignition. From the engine point of view it is better to limit the quantity of steam, but for the practical working of the producer it is still desirable to use a liberal quantity to check the formation of clinker and to reduce the loss of sensible heat. It is difficult to meet these somewhat conflicting ideals, and in practice a sort of compromise is effected by having about 12 to 15 per cent. of hydrogen in the gas.

In recent years the idea of working the producer by suction instead of air-pressure, known in 1862, has been reverted to, chiefly in connection with gas engines.

The production of the steam required to make good gas and to keep the temperature of the fire low enough to prevent the formation of an excessive amount of clinker presents many difficulties. Some makers have a water vaporiser inside the producer, sometimes near the bottom of the fire, but more often near the top; and they heat it by the fire or by the hot gas which leaves the fire. In some cases both these sources of heat are used. On the other hand, some makers prefer to have the vaporiser outside the producer and to heat it by the sensible heat of the gas after it has left the producer. The latter system has the advantage of cooling the gas more, but the amount of steam raised is less than in the other systems, and there is the risk that the gas will not always be hot enough to make the full quantity of steam required. This not only



Dowson Gas Producer for Bituminous Fuels.

affects the percentage of hydrogen, &c., in the gas, but has an important bearing on the formation of clinker. It is, in fact, essential that there should be a sufficiency of steam, but this point does not always receive the attention it deserves.

Apart from producing a sufficient quantity of steam when the maximum volume of gas is required, there is the further necessity for regulating the quantity of steam drawn into the fire when the load on the engine is variable. It has been supposed that when less gas is produced, that is, when less air is drawn into the fire, the lowering of temperature which follows causes less steam to be produced, and that in this way the quantity of steam produced is proportional to the quantity of gas required. This is only partly true, as actually the temperature of the fire does not vary as quickly as the load on the engine may vary, and although there may be a considerable fall in the load, there is usually heat enough in the fire to produce more steam than is then desirable. If this excess of steam continues, it not only causes an excess of carbon dioxide to be formed, but it damps down the fire. Then, when the load is suddenly increased, the temperature of the fire is not high enough to give effect to the necessary reactions, and the gas is not good enough to develop the power required. Some makers of suction plants try to get over this difficulty by having regulating valves worked by the engine, by means of which the admission of steam to the fire is governed by the engine. Some merely allow a vent in the vaporiser for the excess of steam to escape when the load is reduced; others have used the suction of the engine to draw water into the vaporiser in very small quantities, just enough at each suction stroke to give the steam required for the quantity of gas to be consumed. This can only be done provided the vaporiser flashes the water into steam; if the vaporiser holds a body of water, as in a boiler, steam is given off continuously.

To compare the gas made in a suction plant with that made in a steam-jet pressure plant of the same power, the author gives the results (Table I) obtained with a 40-B.H.P. plant of each type working with anthracite, and in a separate column he gives the average results of seven different pressure plants of various sizes ranging from 8 to 300 H.P. :—

TABLE I.

Composition of gas. (Per cent. by volume.)	Suction plant. 40 B.H.P.	Pressure plant. 40 B.H.P.	Average of 7 pressure plants.
Hydrogen	15·64	19·8	17·36
Methane	1·16	1·3	1·20
Carbon monoxide ...	20·13	23·8	25·55
Carbon dioxide ...	6·09	6·3	5·77
Oxygen	0·74	—	0·30
Nitrogen	56·24	48·8	49·82
Calorific value (higher scale)			
B.TH.U. per cubic foot	135·3	164·4	161·0
Calories per cubic metre	1,204	1,463	1,432

From this it appears that the calorific power of the pressure gas is approximately 20 per cent. higher than that of the suction gas. In the latter the percentages of hydrogen and carbon monoxide are lower, while the percentage of nitrogen is higher ; but less air is required for combustion of the suction gas, and a rather larger volume of the latter (compared with pressure gas) can be used for each explosion in an engine—a cylinder of given size. A further point is that there is rather more fluid friction to allow for when suction gas is used. The practical result is that there is a loss of about 5 per cent. in the maximum power of the engine when worked with suction gas. This is not important for small engines, but for those of larger size it must be considered. On the other hand, the heat efficiency of a pressure plant with independent boiler must necessarily be lower than that of a suction plant which produces its own steam without an independent boiler. If the steam for the pressure plant were raised by the sensible heat of the gas produced, as is sometimes done, the heat efficiencies of the two types of plant would then be nearly alike.

In considering the two types of plant for engine work, our general conclusions may be as follows :—A suction plant has certain practical advantages : it costs less and occupies a smaller ground space, but the gas made in it is not so strong as in the older form of pressure plant, and in some cases this advantage of the latter is important. The fuel consumption per H.P.-hour and the labour required are about the same in both types of plant, provided the steam required is raised without an independent boiler. The consumption of water is the same in both types. It is also worth mentioning that where there are several engines to serve, the arrangement of the gas-pipes is greatly simplified, and their cost is proportionally reduced, also the engines can be started more readily, when the gas can be taken from a small gasholder instead of from several suction plants.

No producer makes gas of equal calorific power at all rates of production, and, speaking generally, it may be assumed that the best gas will be made when the producer is worked uniformly at its maximum, or nearly its maximum capacity. At any rate of production considerably less than the maximum, the calorific power of the gas will be lower.

Trials were made at Derby for the Royal Agricultural Society in 1906, with engines running on various loads, and it was found that the gas contained smaller percentages of carbon monoxide and hydrogen, and larger percentages of carbon dioxide and nitrogen, during the no-load periods. The gas made with no load on the engine, immediately after starting, in a cold producer, had a low calorific power and did not materially improve while the producer continued to work without load, yet after the producer had worked for a time at full load, and had become thoroughly heated up, with a good depth of bright fire, it gave gas of considerably higher calorific power than before when the load was again removed. The explanation of this is mainly a question of temperature. It is important to maintain the temperature of the fire as high as possible when the producer is worked at a reduced load by the suction of an engine ; and a step in this direction is to reduce the quantity of steam proportionally to the volume of air drawn in. After a light-load period, full load should be put on gradually, to enable the fire to recover.

For engines and small heating work all tarry vapours must be eliminated before the gas reaches the valves, cocks, &c. This has generally been done with cleaning apparatus, but the author has always held to the opinion that the tarry vapours should be got rid of in the producer itself, and that it cannot be right to let tarry gas leave the producer, and then be obliged to remove the tar by extractors, &c. With this in view, he designed, in 1903, the producer shown in the accompanying figure. This producer is double-acting—that is, air is drawn in through the top and through the bottom of the fuel column. The coal is put in at the top, and the upper part of the fire burns downwards. The hydrocarbons are distilled off, and various useful reactions occur ; the coke which remains sinks down gradually into the lower part of the producer. The coke is there converted into ordinary producer-gas by the upward current of air (accompanied by steam) which is drawn in at the bottom. The mixture of gases leaves the producer through an outlet about halfway between the top and bottom.

When working with ordinary bituminous coal, or with lignite and several other varieties of fuel, *there is no tar* ; it is disposed of altogether in the producer, and no mechanical or other tar extractor is required. After leaving the producer, the hot gas passes through an external vaporiser, to cool the gas, and so raises the steam required for making the gas. It then passes through suitable scrubbers, and is ready for use in the engine to be worked with it. This bituminous plant can be worked by the suction of an engine, or when the gas is to be passed into a gas-holder for distribution to several engines, or to heating apparatus, there is an exhauster to draw gas from the plant and deliver it into a holder.

A plant for 500 H.P. was started in October, 1908, at the works of Messrs. Kenrick & Sons, of West Bromwich, and has been working regularly ever since. The results were so satisfactory that in October, 1909, they started a second plant of this type for 700 H.P., and both plants are now serving 13 gas engines which were previously worked with anthracite pressure gas. The analysis of the gas made in the larger plant was as follows :—

	Percentage by volume.
Carbon monoxide	23·9
Carbon dioxide	7·2
Hydrogen	16·0
Methane	1·0
Nitrogen	51·9

The calorific power of the gas is nearly as high as that of gas made with anthracite in an ordinary suction plant. The fuel used at West Bromwich had the following composition :—

Fixed carbon	55 per cent.
Volatile matter (other than moisture) ...	30 ,,
Moisture	8 ,,
Ash	7 ,,

Calorific value, 13,400 B.TH.U. per lb.

The coal costs 8s. a ton delivered, as against 23s. for anthracite. On an average of several months the consumption of bituminous coal was about the same as with anthracite, namely, about 1 lb. per I.H.P.-hour including all stand-by, cleaning and starting losses. The gas has no tar when it leaves the producer, and none is found in the scrubbers or overflow water ; Messrs. Kenrick have stated that the gas from the bituminous coal is as clean as the anthracite gas previously used. They clean the engine valves only once in about three months.

Among other plants of this type in use, Messrs. Faire Bros., of Leicester, are now working one for 400 B.H.P., and they find that their engines work as well with it as with the anthracite plant they previously used. In their case they use a coal of the following composition when dried at 212° F. :—

Fixed carbon	57·90 per cent.
Volatile matter	37·50 ,,
Sulphur	1·00 ,,
Ash	3·60 ,,

Moisture 11·10 per cent.
Calorific value 12,100 B.TH.U. per lb.

At first the author thought that these plants would not be suitable for small powers, but more recently he has had a 30-H.P. suction plant of this type working regularly for about eight months, and it has given no more trouble than an ordinary suction plant working with anthracite or coke. The engine valves were not cleaned for five months.

MM. Boutillier & Cie., of France, have a producer in which bituminous coal is forced into the bottom of the fire by means of a screw feed, and as the producer is worked with an up-draught from a blower, the tarry vapours distilled off at the bottom pass through the incandescent fuel above. Power is, of course, required to send in the coal, and the rate of feed must be regulated to suit the rate of consumption. The author has seen a plant of this type working well with semi-bituminous (*demi-gras*) Belgian coal, containing 12 to 13 per cent. volatile matter. He does not know what the result would be with English coal, which usually contains not less than 30 to 35 per cent. of volatile constituents.

The Effect of Varying Proportions of Air and Steam on a Gas-Producer.

By E. A. Allcut, M.Sc.

(*Abstract of Paper read before the* Institution of Mechanical Engineers, *April 28th*, 1911.)

In the experiments recorded in this paper, on a small gas-producer working under conditions similar to those of a suction-gas plant, the supply of air was kept constant while the steam supply was varied from nothing to a maximum of 1·14 lb. per lb. of coal. Anthracite peas were used for fuel.

High temperature favours the formation of CO, giving richer gas and higher efficiency ; at lower temperatures a higher proportion of CO_2 is obtained. The steam supply to the producer has an important effect, as it controls the temperature and therefore the efficiency of the plant.

It was found that the maximum amount of steam that could be decomposed by anthracite at a temperature of about 1,000° C. was about 0·585 lb. per lb. of coal ; no advantage could be derived from increasing the steam supply above 1½ lb. per lb. of coal in large producers, or ¾ lb. in small ones, as small quantities of steam

suffice for the prevention of clinkering. The percentage of CO_2 remained constant in spite of the varied supply of steam to the fire; the bed of fuel, to a depth of 18 in., was at a temperature of about 1,000° C., while above that there was a layer of fuel 6 or 7 in. deep at 600° C., and in the former the gases produced were almost entirely CO and hydrogen, while CO_2 was reformed in the cooler layer above. If the cool layer had been thicker, more CO_2 would have been formed. In producers with a shallow fuel bed, and no inward leakage of air, there need not be more than 2 or 3 per cent. of CO_2 in the gas, and therefore the depth of the fuel bed should be cut down to the lowest value consistent with practical working.

The percentage of combustibles in the gas increased until 0·7 lb. of water per lb. of coal was reached, and then decreased again; and the calorific value reached a maximum about this point. The efficiency of the producer (heat available for external work ÷ total heat in coal) also attained the maximum at this point, and the temperature of the issuing gases fell to 550° F., near which it remained with greater quantities of steam.

The loss of heat in the washer was at its lowest for 0·4 to 0·7 lb. steam per lb. of fuel, above which it rose rapidly.

Economising Fuel and Utilising Waste Heat.

A PAPER was recently read before the INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND, by Mr. Thomas B. Mackenzie, on the subject of economising fuel and utilising waste heat in malleable-iron and steel works. The bulk of the paper related to the working of steam rolling-mill engines, and the economies to be effected by compounding them, and by preventing the waste which takes place when exhaust steam is allowed to escape into the atmosphere. Until within the last few years the only use to which such heat could be applied was heating feed water, &c. Since the advent of the steam turbine, however, it has become possible to collect it in a closed system of pipes and use it in low-pressure, or so called exhaust turbines; when used with intermittently running engines, such an installation consists of three essential parts:—A thermal storage tank, called by Prof. Rateau the heat accumulator; the turbine proper; and the condenser and its pumps. The pressure in the thermal storage tank supplying these turbines is usually 17 to 17½ lb. per sq. in. absolute; it is dangerous to let it fall to that of the atmosphere, and fatal to let it get below. To prevent this occurring, two methods are in use, either to fit a reducing valve which will allow live steam to pass at the lowest permissible pressure into the storage tank, or, as in more recent practice, to fit a mixed-pressure turbine. The latter is by far the better method, as the live steam can then be used with maximum efficiency.

In considering the adoption of an exhaust turbine, it must be clearly kept in mind that its introduction will, by raising the back pressure, increase the steam consumption of the engines exhausting into the thermal storage tanks. This increase of back pressure will not be less than 3 lb. per sq. in. by gauge.

The loss by condensation, leakage, &c., between the reciprocating engines and the turbines will generally be about 15 per cent. For every 100 kg. of steam which a non-condensing engine uses when exhausting freely into the air it will, when connected to thermal storage tanks, use 120 kg. Of this, 102 kg. will be available in the turbine. The author had recently occasion to witness a careful test of a mixed-pressure turbine, and the result showed that with dry saturated steam at 17 lb. per sq. in. absolute and a vacuum of 27 in. of mercury, the steam consumption was 12·1 kg. (26·6 lb.) per H.P.-hour, the thermal efficiency of the turbine being ·626. A weight of 102 kg. of steam is capable, therefore, of developing 8·42 H.P.-hours. As a live steam turbine, working with the same initial pressure and degree of superheat as the reciprocating engine, would use 54·7 kg. of steam to develop the same power, the non-condensing engine should be credited with this amount, making its equivalent net consumption 120 − 54·7 = 65·3 kg. in the same time that it formerly used 100 kg. when exhausting freely to the atmosphere.

The so-called exhaust turbine is, however, a much overrated piece of machinery. The makers, and those interested in its sale, paint the savings to be effected by its use in such glowing colours that the unwary steam user might suppose that no matter how old or wheezy his engine might be, all he had to do, to enable him to live happily ever after, was to place an exhaust turbine beyond and in series with it. This is a fallacy.

The legitimate use of low-pressure turbines is to deal with the steam from such tools as steam hammers, steam hydraulic forging presses and shearing machines, and such engines as from special circumstances cannot easily or economically be compounded. In every other case it is better rather to prevent waste of steam than to allow it to go on and then try to utilise it.

It must further be borne in mind that the energy contained in the steam from the main engines is, in nearly every case, greatly in excess of that required for the auxiliaries. It will seldom, therefore, be possible to use the whole of the exhaust, unless it can be converted into electrical energy and disposed of to a power company, or otherwise.

Making an estimate of the steam requirements for an all-electric drive, the author refers to Mr. Ablett's paper, read before this Institution last session, and assumes that both cogging and finishing mills are connected to the same fly-wheel set, consisting of a live-steam turbine connected to one or more direct-current generators, a fly-wheel being mounted on the shaft to store and restore energy as required—this being, in the author's opinion, the best method to adopt when steam, and not blast-furnace gas, is the source of power, as the cost of a central power station is saved

The output of a furnace is assumed to be 2·7 tons of steel per hour, requiring 70 H.P. for rolling.

Taking the steam pressure as 120 lb. by gauge, the superheat at 35° C., and the vacuum at 95 per cent., as high vacua are desirable with steam turbines, the theoretical consumption of a perfect engine under these conditions is 3·56 kg. per H.P.-hour. The speed of the turbine has to be a compromise between the speed at which it would run with maximum efficiency and that at which the electric generators would run. Assume, therefore, a thermo-dynamic efficiency of ·6, making the steam consumption of the turbine on full load 6 kg. per H.P.-hour. As, however, a turbine directly connected to a set driving rolling mills could never average full load, the consumption might be increased to 7·5 kg. per H.P.-hour. The turbine's requirements are then:—2·7 tons of steel per hour × 70 H.P.-hours × 7·5 kg. per H.P.-hour = 1,425 kg. per furnace per hour, to which must be added 324 kg. for the auxiliary machinery, and, say, 251 kg. to allow for leakages, &c., a total of 2,000 kg. per furnace per hour.

The heat necessary to generate this quantity and quality of steam is 1,460,000 kg. calories; 49·4 per cent. of the heat going up the chimney of the smelting furnace (2,957,400 kg. calories) is, therefore, sufficient to generate all the steam necessary in this case. As the temperature of the chimney gases is, however, comparatively low, this would not be practicable, and some live gas would require to be burned, the exact amount being found by trial; in all probability 400 to 600 m^3 per hour would be sufficient.

The author directs attention to the fact that considerable other savings would be effected by the mode of driving under review. Owing to the absence of reciprocating parts, and to the fact that all rotating parts are perfectly balanced, the cost of upkeep would be less. Substantial savings would also be obtained in cost of oil, waste, &c., and as the steam flowing through the turbine does not become impregnated with oil, the water of condensation could be pumped from the hot well straight to the boilers without treatment.

In the case where there are blast furnaces, it will generally be better to use the waste gas from them in gas engines, both for blowing the furnaces themselves and for providing the electrical energy necessary to drive the mills, &c., in the steel works. It might then happen that the ordinary power requirements of the whole works were met without requiring any steam. In that case, if waste is to be prevented, some other use must be found for the steam generated by the waste heat from the smelting furnaces.

In some districts it may be possible to dispose of this to the local power company. Where such outlet cannot be found, electrical refining of part of the steel made might with advantage be resorted to.

In a paper read at the autumn meeting of the Iron and Steel Institute last year, Mr. Campbell stated that, to refine molten steel taken from a basic-lined smelting furnace, from 100 to 150 KW.-hours per ton were necessary.

Assuming a 15-ton furnace, and taking the mean of the values given, 1,875 KW.-hours will be required. As the load factor in the power station supplying electric furnaces should be high, 6 kg. of steam, of the quality previously dealt with, might be taken as the consumption per H.P.-hour. Taking a dynamo efficiency of 90 per cent., this is equivalent to a consumption of 9 kg. (19·8 lb.) per KW.-hour. The total amount of steam, allowing for leakages, &c., will therefore be 18,000 kg. per hour for this size of furnace. Using 1,200 m^3 of live gas along with the chimney gases, 3,000 kg. of steam can be generated per furnace. Six smelting furnaces would therefore be required to supply steam enough to provide energy for a 15-ton electric refining furnace. By burning more live gas, this number could be reduced to any desired extent.

Of the several methods considered by the author for economising fuel and utilising waste heat, either in exhaust steam or chimney gases, the turbo-electric drive with waste-heat boilers is the most economical, saving 82 per cent. of the fuel required by hand-fired boilers and non-condensing engines.

It is obvious that in the case of waste-heat boilers the use of "Mond" gas would still further reduce the cost of fuel.

The above are savings in fuel only; the net saving would of course have to be arrived at by taking into consideration the cost of the apparatus necessary to obtain it.

In conclusion, the author hopes that the publicity given to the subject by bringing it before the Institution will be the means of more fully directing the attention of those members who design manufacture, and sell the apparatus necessary to obtain the ends aimed at, and inducing them to come to the assistance of the steel and iron manufacturers. The problem is of importance not only to the steel and iron manufacturers themselves, but also from the point of view of public health, as its solution would reduce the smoke, steam, and noise at present associated with such works, and so improve the amenity of the districts in which they are located. It is also of national importance, as whatever reduces waste of fuel tends to prolong the life of our coalfields.

Fire.—By a fire which occurred on Friday the premises of Mr. Ostick, dealer in electrical apparatus and fittings, Strand Street, Douglas (I.M.), were destroyed, together with the contents.

Finland Customs.—A new order has just been issued by the Customs authorities in Finland, under which, in future, all electrical machinery and apparatus imported into the country will be dutiable as follows: when weighing up to 2,000 kg., and when made mostly of iron, 47·10 Finnish marks (= about 37s. 8d.) per 100 kg.; when more than 2,000 kg. in weight, the duty is 14·70 Finnish marks (11s. 9d.) per 100 kg.

OUR LEGAL QUERY COLUMN.

[Questions addressed to this column should be written on one side of the paper only.]

"F." writes :—"A local authority formed a lighting district and got a provisional order in 1905, and in the same year proceeded to supply public and private lighting. In August, 1910, a local gas company got permission from the road authority to open the road. The oil company then proceeded to put down a gas main, and are now supplying gas to the district. Have the oil company any legal right to do such a thing without first procuring a provisional order?"

* * * It seems that the oil company have a perfect right to open the road if they have the permission of the local authority, but they must comply with the law which protects the electric lighting company. If they in any way interfere with, or injure, the electric cables they can be held liable in damages.

"Cables" writes :—"A legal authority supplying electricity and working under a provisional order, granted 10 years ago, appear to be charging several different rates for current consumed. Am I correctly informed that anyone wishing a supply can demand the supply on exactly the same terms as those extended to a customer taking an exactly similar supply? I understand that if the undertakers give a preferential rate to one customer, any others might demand it."

* * * The law on this point is thus stated in the Electric Lighting Act, 1882, Sec. 19 :—"Where a supply of electricity is provided in any part of an area for private purposes, then, except in so far as is otherwise provided by the terms of the licence, order, or special Act authorising such supply, every company or person within that part of the area shall, on application, be entitled to a supply on the same terms on which any other company or person in such part of the area is entitled under similar circumstances to a corresponding supply."

Mr. Knowles, in his "Law Relating to Electricity," thus comments on this section : "The language of this section is wide, but the nature of the obligation imposed shows that the interpretation must be somewhat narrow. The right of an occupier within the area 'to a supply on the same terms on which any other company or person in such part of the area is entitled under similar circumstances to a corresponding supply' does not arise until a contract has been entered into with the undertakers. 'I think that section (*i.e.*, Sec. 19) contemplates an arrangement or a contract between the occupier and the undertakers, and that the words "entitled to a supply" mean entitled to a supply under, and by virtue of, a contract made between the occupier and the undertakers. The terms of the supply may vary. There is a maximum charge, and Sec. 20 prevents undue preference. But within those limits it is left to the undertakers to make such bargains as they may think fit with the individuals who come to them for a supply of electric current' (Husey *v.* London Electric Supply Corporation, 1902, 1 Ch. 411, per Cozens-Hardy, L.J., at p. 424). The Court of Appeal thus confirmed Buckley, J., in Metropolitan Electric Supply Co. *v.* Ginder (1901), 2 Ch. 799, where he said, 'Now, that last expression, "a person is entitled," means, I think, is entitled by arrangements made between him and the company.'"

"Public" writes :—"I have recently applied for a supply of electricity from the local undertakers who are working under the usual prov. order; they ask what appears to me an unreasonable sum for laying the supply into my premises. My house is situated in a street *where no mains are laid*. The mains appear to be about 70 yards away, and they contend they are justified in charging for the cable used in bringing in the supply, although the street in which my house is situated should really have the mains laid down, it being within what is termed the 'compulsory area'; and I am informed that although their mains are not laid along this street, they are obliged to lay them within a period of two years from the time the prov. order was granted if they are required to do so. If they did this I should only be a few yards from the mains, and the cables would not have to cross any private property."

* * * "Public" appears to be in a difficulty. Sec. 27 (1) of the Electric Lighting Clauses Act, 1899, provides that the undertakers shall, upon being required to do so by the owner or occupier of any premises situate within 50 yards from any distributing main of the undertakers in which they are, for the time being, required to maintain, or are maintaining, a supply of energy for the purposes of general supply to private consumers under the special order or the Board of Trade Regulations, give, and continue to give, a supply of energy for those premises in accordance with the provisions of the special order, and of the said Regulations, and they shall furnish and lay any electric lines that may be necessary for the purpose of supplying the maximum power which any such owner or occupier is entitled to be supplied, under the special order, subject to the conditions following (that is to say) :—

The cost of so much of any electric line for the supply to any owner or occupier as may be laid down upon the property of that owner or in the possession of that occupier, and of so much of any such electric line as it may be necessary to lay for a greater distance than 60 ft. from any distributing main of the undertakers, although not on that property shall, if the undertakers so require, be defrayed by that owner or occupier.

The expression "main" as used in the above section means "any electric line which may be laid down by the undertakers in any street or public place, and through which energy may be supplied, or intended to be supplied, by the undertakers for the purposes of general supply."

So far as one can see, the obligation of the authority is limited to the supply of premises within the prescribed distance from the mains, and they may make special terms with other consumers.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Ferranti Ironclad Switch.

In the notice of this switch in our issue of April 28th, by an unfortunate slip the voltage up to which it was made was stated as 200 volts; it should have read 600 volts.

"Thames" Automatic Tumbler Switches.

To meet the demand for small automatic circuit-breakers, the Thames Ironworks, Shipbuilding & Engineering Co., Ltd., (Electrical Engineering Department), Canning Town, London, E., are now placing on the market what is claimed to be the smallest circuit-breaker extant, manufactured under Denny's patents; fig. 1 shows the switch in section, the magnet being protected by a porcelain surround, but it can be had without the porcelain surround, the latter type being more suitable for distribution boards and conduit boxes.

The object of these switches is to provide a reliable automatic switch for small powers up to 5 amperes and suitable for voltages up to 500. To a large extent they may replace the ordinary small porcelain bridge fuses and cut-outs for lighting and small power circuits, and incidentally obviate the trouble and inconvenience of replacing blown fuses.

Distribution boards can be fitted either with D.P. auto-tumblers or with S.P. auto-tumblers and S.P. fuses, the fuses being rated about 50 per cent. above the current necessary to trip the switches. In either case the size of the distribution board is considerably reduced, and greater efficiency results. In size and appearance the switches are

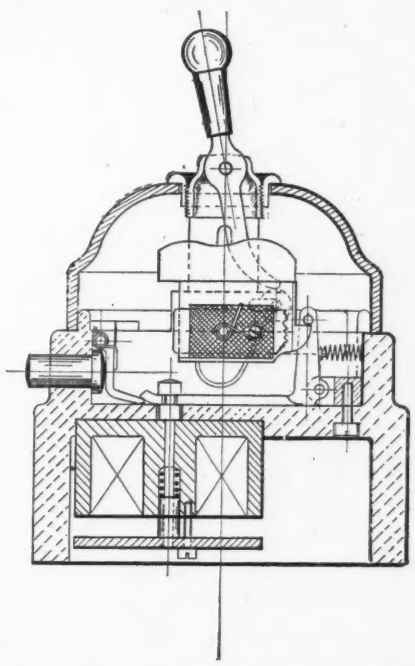


Fig. 1.—Thames Automatic Tumbler Switch (Denny's Patent).

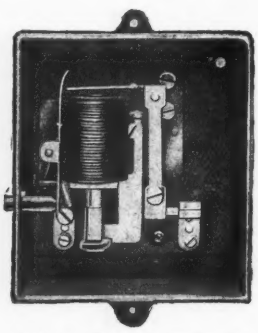
very similar to the ordinary tumbler switch, and are self-contained with a special type electromagnet, the winding of which is in series with the switch. The armature of the magnet is in direct mechanical connection with a tripping lever, which retains the switch circuit-closer in the "on" position. Should an overload occur the armature is attracted by the magnet and the tripping lever thereby operated, thus releasing the switch, which opens instantaneously, it having no time element like the fuse. The operating lever or knob is not fixed in any way to the switch parts, so that it is impossible to close the switch on a short circuit. To release the switch by hand a push button is provided at the bottom of the switch, which, on being depressed, operates the tripping lever, giving a quick break to the switch independently of the operator.

These switches are suitable for high-voltage installations, such as electric railways, mines and tramways, and should prove economical, as outlay on cartridge fuses for replacements on these circuits is

generally very heavy. They are also quite suitable for use as limit switches on a contract system of lighting, and can be supplied in various designs and finishes. The rapidity with which they act on a short circuit renders them valuable safeguards against fire risk.

"Adnil" Current-Limit Switch.

The Adnil Electric Co., Ltd., of Adnil Building, Artillery Lane, E.C., have introduced a limit switch for use in the supply of electricity without a meter on the contract system. The switch, which is shown in figs. 2 and 3, is designed to cover a range of currents from 0·2 to 6 amperes, in two types and six sizes. When



Figs. 2 and 3.—"Adnil" Current-Limit Switch, Type W.

the maximum current is exceeded, the switch causes the lights to flicker, and if the excess is maintained the installation is switched off altogether. Connection is restored by pressing the button shown at the side of the box, but the switch continues to break the circuit if the proper current is still exceeded. Provision is made for adjustment and sealing by the supply authorities.

"Foster" A.C. Dimming Switch.

The Foster Engineering Co., Ltd., of Morden Road, Wimbledon, S.W., have brought out an alternating-current dimming switch, consisting of a variable choking-coil with six steps. The appliance is neat and compact, and has the advantage that the energy dissipated by it is very small, there being no resistance in it but that of the copper winding. For sick rooms, and other places where a dim light is often required, and for regulating small apparatus such as motors, fans, irons and radiators, on A.C. circuits, this device should be very useful and convenient.

"Kwik-fix" Ceiling Rose.

The accompanying illustrations, fig. 4, show a novel pattern of ceiling rose, which has been introduced by Messrs. A. Emanuel and Sons, Ltd., of 7-13, George Street, Manchester Square, W. The essence of the device is that the flexible leads terminate in spring plugs, which can be fixed on them without ascending a ladder; the base is provided with corresponding sockets, and its construction is such that when the plugs are slipped into place and the leads twisted round the porcelain knobs as shown, the weight of the fitting is entirely taken off the terminals, without the aid of knots, &c. Thus, the ceiling-rose base having been fixed and wired in the ordinary way, the fitting can be connected up, and attached to the

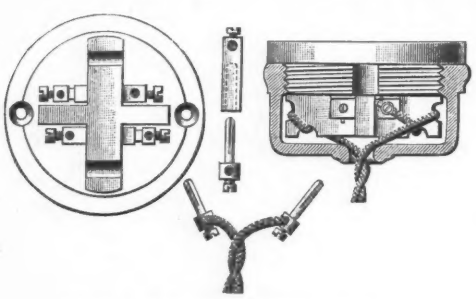


Fig. 4.—"Kwik-fix" Ceiling Rose.

rose in a few seconds. Obviously, the fitting can be as easily removed in case of need. There are no back connections on the base, so that its insulating qualities are high, and the whole is of English manufacture. Not the least advantage claimed for this device is that it permits of temporary fittings being quickly put up so as to get the light on and enable a new installation to be passed by the supply authority, while the permanent fittings can be substituted at leisure. It is also possible to renew the flexible of the fitting while the current is on, without fear of short-circuiting. A sample which we have inspected fully comes up to all these claims.

"Twinbreak" Ironclad Switch.

The General Electric Co., Ltd., of 67, Queen Victoria Street, E.C., have sent us particulars of their new "Twinbreak" switch, in the design of which special attention has been devoted to ensuring that all the four contacts open and close simultaneously. Fig. 5 shows how this object has been attained, all the contacts being at the longest radius of the blades, and the hinges forming no part of the circuit. Moreover, owing to the long radius, and the fact that

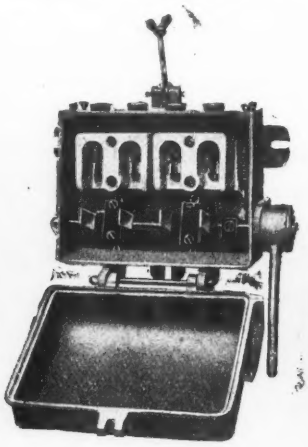


Fig. 5.

Fig. 6.

"Twinbreak" Ironclad Switch.

the maximum tension of the operating spring is applied at the moment when the blades leave the contacts, a very rapid break, and a long break, is obtained. Mica under compression is used for insulation, and the contacts are surrounded by porcelain. The switch complies with the Home Office regulations, having earthing terminals for the case, and an indicator to show whether the switch is open or closed, and the case being interlocked with the switch. The quick-break spring is arranged so that it has no tendency to open the switch when the circuit is closed, and the handle, in accordance with the best designs, is at the side of the case instead of projecting through a slot in the cover. The switch is made for 20 amperes at 500 volts.

TURIN EXHIBITION.

The following is a preliminary list of the exhibitors who are connected more or less closely with the electrical industries:—

Messrs. Edgar Allen & Co., Ltd. (Sheffield); Alley & MacLellan, Ltd. (Glasgow); Sir W. G. Armstrong, Whitworth & Co., Ltd. (Newcastle-on-Tyne); W. & T. Avery, Ltd. (Birmingham); E. H. Bentall & Co., Ltd. (Maldon); Blackstone & Co., Ltd. (Stamford); Bon-Accord Engineering Co., Ltd. (Aberdeen); The British Ackley Brake Co. (London); The British Vacuum Cleaner Co., Ltd. (London); Brooks & Doxey, Ltd. (Manchester); The Cambridge Scientific Instrument Co., Ltd. (Cambridge); The Campbell Gas Engine Co., Ltd. (Halifax); The Castner-Kellner Alkali Co., Ltd. (London); Chance Bros. & Co., Ltd. (Birmingham); Clayton & Shuttleworth, Ltd. (Lincoln); The Coventry Chain Co. (1907), Ltd. (Coventry); Crypto Electrical Co. (London); F. Darton & Co. (London); Doulton & Co., Ltd. (Burslem); J. Fowler & Co. (Leeds), Ltd. (Leeds); R. Garrett & Sons, Ltd. (Leiston); E. Green & Son, Ltd. (Wakefield); John J. Griffin & Sons, Ltd. (London); Hacking & Co., Ltd. (Bury); Alfred Herbert, Ltd. (Coventry); J. Hetherington & Sons, Ltd. (Manchester); Holden and Brook, Ltd. (Manchester); R. Hornsby & Sons, Ltd. (Grantham); Hulse & Co., Ltd. (Salford); Johnson, Matthey & Co., Ltd. (London); George Kent, Ltd. (London); William Kenyon & Sons, Ltd. (Dukinfield); Marshall, Sons & Co., Ltd. (Gainsboro'); J. and H. McLaren (Leeds); Merryweather & Sons, Ltd. (Greenwich); The Morgan Crucible Co., Ltd. (London); Muirhead and Co., Ltd. (Beckenham); Nalder Bros. & Thompson, Ltd. (London); Negretti and Zambra (London); Ozonair, Ltd. (London); R. W. Paul (London); Petters, Ltd. (Yeovil); Pulsometer Engineering Co. (Reading); The Reason Manufacturing Co., Ltd. (Brighton); Reavell & Co., Ltd. (Ipswich); Hans Renold, Ltd. (Manchester); Reyrolle & Co. (Hebburn-on-Tyne); J. Ruscoe and Co., Ltd. (Manchester); Ruston, Proctor & Co., Ltd. (Lincoln); The Simms Magneto Co., Ltd. (London); W. F. Stanley & Co., Ltd. (London); G. Stibbe & Co. (Leicester); The Synchronome Co. (London); E. R. and F. Turner, Ltd. (Ipswich); Underfeed Stoker Co., Ltd. (London); Venner & Co. (London); C. C. Wakefield & Co. (London); John Walsh Walsh (Birmingham).

Colne Lighting.—The T.C. has decided to apply to the L.G.B. for sanction to borrow £2,000 for the purpose of extensions to the electrical mains.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

Proposed New Swedish Tariff.

The following is a statement of the rates of duty leviable on electrical and similar goods under the proposed new Swedish Tariff which is to come into force on December 1st next. Some of the rates given below may possibly be reduced as the result of the negotiation of commercial treaties between Sweden and other countries, and notifications of such reductions will be made in the Electrical Review, should they occur.

1 kroner = 1s. 1½d. 1 kg. = 2·204 lb.

	Kronor per kg.
Asbestos, unworked, also manufactures of asbestos not specially mentioned, with or without admixture of other substances, and even if in combination with other materials	Free
Mica, unmanufactured; also manufactures thereof not specially mentioned	Free
Asphalte, natural or artificial	Free
Machine and transmission belts, &c., of leather ...	·65
Celluloid, &c.; unwrought sheets, rods, tubes, &c. ...	Free
Other manufactures	·80
Packing and insulating materials of soft india-rubber in combination with textile materials, asbestos, &c.	·30
India-rubber (soft) articles not specially mentioned, for industrial purposes	·80
Machine belts of rubber	·35
India-rubber (hard), rods, cords, pipes, &c.	·50
Articles of india-rubber not specially mentioned ...	1·50
Insulators, buttons, conduit pipes, cover slabs, and other articles for insulating electric wires and conductors, of earthenware even if in combination with iron:	
White	·20
Other kinds	·25
N.B.—If an arrow or other marking, serving only for guidance in using the article, and if of no importance as regards appearance, is placed on goods of this description, which are otherwise white, such marking may be neglected for purposes of assessing duty.	
Glass insulators	·25
Lamp shades of glass	1·00
Railway and tramway rails	Free.
	Per 100 kg.
Wire of iron, cold rolled or drawn (other than polished, or so-called, silver, steel, and piano wire):	
Flat, of a thickness of 6 mm. or more	5
Flat, of a thickness of less than ·6 mm., but not less than ·3 mm.	6
Flat, of a thickness of less than ·3 mm.	8
Other than flat:	
The greatest dimension of the cross-section being 1·5 mm. or more	5
The greatest dimension of the cross-section being less than 1·5 mm. but not less than ·5 mm. ...	7
The greatest dimension of the cross-section being less than ·5 mm.	10
N.B.—Wire coated with other metals pays a surtax of 20 per cent. on the above rates.	
	Per kg.
Wire of iron with textile materials, or paper spun round or coating it	1
Sole plates, sleepers, fishplates, rail clamps, points, crossings, &c.	Free
	Per 100 kg.
Bogies and under-frames for railway or tramway vehicles, with or without accessories	8
Axles, straight, not worked for railway or tramway material	6
Axles, straight, worked for railway or tramway material	7
Wheels, loose not worked, also tires	6
Sets of wheels, springs, buffers, &c.	7
	Per kg.
Electric furnaces, cooking apparatus, flat irons, arranged for heating by means of electricity, electric stoves	·18
Copper wire, rolled or drawn:	
Of round, square, rectangular or hexagonal section; also so-called trolley wire (contact wire):	
The greatest dimension of the section being 0·5 millimetre or more, not coated with any other non-precious metal; also so-called braided (*drillerad*) wire not more than 1 millimetre in diameter	0 10
Other kinds, not specially mentioned	0 12
Of other section	0 25
Gilt or silvered	2 50
Note.—Articles are only to be classed as wire if the maximum dimension of their section does not exceed 10 millimetres, but this restriction is not applicable to trolley wire, which is to be classed as wire without reference to its breadth.	

(*To be continued.*)

PATENTS EXPIRING IN 1911.

The following abstracts prepared by Messrs. W. P. Thompson & Co., 285, High Holborn, London, W.C., relate to patents of interest to electrical engineers applied for in 1897, which, having been kept in force for their full term of 14 years, expire during the present year unless extended by the order of the Court. Of the 500 patents kept in force for their full term, 38 refer to electrical subjects:—

2,801. February 2nd, 1897. "Electric transformers." A. F. Berry.—The core is formed of a number of L-shaped plates alternately inverted and arranged in radial grips, the centre being hollow. Intermediate groups with narrower plates are also fitted, and are held in position by wooden blocks. The core is clamped betwen perforated end-plates so as to allow a free circulation of air. In building up the transformer, the L-plates are first placed in position on a central core or mandrel, then the insulating layers are fitted, next the coils (suitably insulated), and finally the L-plates to complete the core.

2,818. February 3rd, 1897. "Electricity, measuring, stuffing-boxes." S. Z. de Ferranti. Motor meters in which liquids are used are provided with means for closing the spaces containing them when the meters are to be moved. The armature spindle is supported by a float immersed in mercury. An enlarged part of the spindle is situated within and clear of a rubber ring which may be compressed on a shoulder by a sliding tube.

2,904. February 3rd, 1897. "Perforators for automatic telegraphs." F. L. Muirhead.—Perforators for the paper strips of automatic telegraph transmitters are arranged with a case containing levers, controlled by the keys for operating the fingers for the punches and the pawl through the slide of the paper feed-wheel. The punches and their slides are mounted on a base adjustably secured to the case by screws, and are capable of easy removal. The rear ends of the punch rods are so bent that the fingers strike at a uniform distance from their fulcrum. The feed-wheel is adjustable by slots and screws.

4,120. February 16th, 1897. "Tapering or shaping metallic articles." W. Hall.—This relates to improvements in shaping metallic articles by the use of an electrolytic bath, the article forming the anodes, or by simply dipping them into an acid. Among articles which may be formed by this invention are needles, knitting pins, whip cores, centres of fishing rods, parts of cycles and cycle saddle framings and springs, cop spindles, pins, tools, cutlery blades of all kinds and metal pipes and tubes. The articles are formed round of a uniform shape by rotating them within, or moving them through, the electrolyte during the process. The articles may be thinned, tapered, &c., by drawing them through an electrolytic solution, either at an intermittently or continuously uniform rate, or at a varying and gradually increasing or decreasing rate. Or the same result may be brought about by increasing or decreasing the intensity of the current employed while the wire or other article is drawn through the electrolyte.

8,180. March 30th, 1897. "Telegraphs, type-writers." W. L. Wise. (C. L. Buckingham, U.S.A.)—This relates to an apparatus for printing messages in page form upon sheets of paper. The sheet of paper has two opposite edges pasted together to form a tube, and a row of perforations is made along the stiffened part formed by the overlapping edges. The invention consists mainly in apparatus for supporting and feeding the tube of paper.

8,376. April 1st, 1897. "Magnetic separators." G. Kentler and F. Steinert.—The apparatus comprises a series of stationary magnets and a rotary magnet-ring. The slag is fed from a hopper, and is carried over the magnets and round the ring by an endless band. The commutator is stationary and mounted upon a plate while the brushes are mounted upon a revolving frame. During the revolution of the brushes, the polarities of the magnets are rapidly changed, so that a vibrating motion is given to the particles. The magnetic particles pass into a wagon, a small portion of non-magnetic material mechanically carried forward by the magnetic stuff passes into a wagon and the grgater part of the non-magnetic material falls at once into a receptacle. In another form of separator, all the magnets are stationary and mounted upon an inclined frame provided with downwardly-curved prolongation at the upper end. In a third form, the magnets are mounted upon a rotary ring, and there is a commutator adapted to demagnetise the two magnets of the series which happen to be lowest at any period of a revolution.

8,663. April 5th, 1897. "Dynamo-electric machines." A. Holmes (E. H. Johnson and R. Lundell).—This relates to continuous-current. A field magnet core consists of two similar steel castings, one being inverted relatively to the other. They are made with lugs and bolted together, forming a spherical casing, having an elliptical opening in each end, and two pole-pieces projecting inwards. The ends are bolted to disks cast with supports of any desired form, and cylindrical boxes, a conical extension being interposed on one. Openings in the disks below the shaft allow ventilation. The field winding is a ring placed as shown, conductors to it being passed through a bush. The armature shaft is carried in bearings secured in the boxes; these are closed by caps to hold oil, and oiling rings are placed on the shaft within slots and pins on the bearings. The armature is thus removable without taking apart the field magnet.

9,457. April 13th, 1897. "Electric transformers." A. F. Berry.—The core is constructed of a number of flat plates which are interlocked so as to leave a space for the coils. These plates are formed in radial groups between which are fitted groups of smaller plates. In building a transformer the plates are held on a "former" between two grooved end plates secured by a bolt. The primary and secondary coils are then wound, being separted by suitable insulating material. The cores are then completed by placing the plates in position, and separating the groups by the wooden or like blocks, the whole being tightly bound with wire. The "former" and end plates are then removed, leaving large ventilating spaces, and the transformer fitted in a casing having suitable terminals and connections. To facilitate dissipation of heat, copper tubes coated with lampblack are, in modifications, arranged around or between the sections and a current of water or the like caused to flow through.

11,575. May 10th, 1897. "Syntonic telegraphy." O. J. Lodge.—This relates to a system of signalling by Hertzian radiations in which the oscillations are damped so as to render them slower, and thus allow of more accurate syntonising between the transmitting and receiving instruments. The transmitting apparatus in which two wings are separated by a spark gap. On each side of the spark gap a self-inductance is arranged, although the whole of the inductance may be arranged on one side. The Ruhmkorff or other generator may be attached directly to the wings, or may be connected to two Leyden jars, the outer coatings of which may be connected by a self-inductance of thin wire, the outer coatings are also connected to the spark gaps. In this case the spark gap may be omitted, and the spark gaps made with polished balls protected from ultra-violet light. The apparatus may be syntonised by making the inductance adjustable, either by short-circuiting some of the coils or by employing several coils any one of which may be put into circuit, or by adjusting the capacity of the condensers (Leyden jars). A secondary coil in circuit with the coherer may be placed round the inductance instead of connecting the coherer to that coil. Any coherer may be employed, but a special form is described consisting of an adjustable spring, and a fine metal point making contact therewith. The spring is vibrated by a fine toothed wheel driven by clockwork, &c., by a tuning fork, or by the vibration of the clockwork. The wings may be various forms, such as the metal roof of a shed, and one may be omitted, the lower ball of the gap being connected to earth.

13,838. June 5th, 1897. "Electric switches." G. Page.—In order to secure efficient contact the movable contact-bar is made in two or more independent sections forced together, or apart, by springs. The movable contact bar is formed of two pieces forced apart by springs. Springs are provided to give a quick break, and the handle is fitted with an enlarged part to serve as a guide. The contact-bar is carried in an enlargement of the lever. The contact is preferably carried in a block having a rotary movement. The contact strips may be slit to give them greater resilience.

13,971. June 8th, 1897. "Electric controllers." British Thomson-Houston Co. (E. D. Priest).—Pneumatically-operated controllers have a number of separately-actuated contacts instead of resistance and commutating cylinders. The contacts of the resistance switch are mounted on a support, and are adapted to be engaged by contacts mounted in pistons sliding in cylinders. These cylinders, which form an electrical unit, are connected by passages to the air valve. The pistons are surrounded by springs, so that the circuits are automatically broken should the air supply fail. A blow-out magnet is arranged at the points of contact of the resistance switch. It has projecting pole-pieces, which are so arranged that the arc is alternately driven outwards and inwards. The circuit is broken at the resistance switch before any change is made in the connections of the motor, such as from series to parallel, &c., the handle being always moved in the one direction, or it may be moved backwards.

13,973. June 8th, 1897. "Electric controllers." British Thomson-Houston Co. (E. D. Priest and F. A. Merrick).—This relates to controllers for connecting motors in series or parallel, suitable resistances being first interposed or cut out. The contacts are controlled by pneumatically-operated mechanism. The movable contacts are carried on the ends of piston rods sliding in cylinders. The cylinders are connected by pipes embedded in the casing, with a main valve. The blow-out magnet is formed of a number of coils mounted on a core provided with a number of pole-pieces. Chutes are fitted for restraining the arc. The core is removable for obtaining access to any of the coils. Springs are provided for breaking contact when the air escapes. An auxiliary valve which is supplied with air from the main valve when the latter is in certain positions, controls the commutating switch, which consists of the fixed contacts and the movable contacts.

13,976. June 8th, 1897. "Electric motors, meters and transformers." British Thomson-Houston Co. (C. P. Steinmetz).—The field coils of a two-phase induction motor, having a short-circuited rotatable armature are supplied with currents differing in phase, from a single-alternating current circuit. The main circuit is divided through two field coils, and two different coils on one core. This arrangement is applicable to meters for registering current or differences of potential, with slight modification. One coil, C, carries the main current. Another coil, D, is connected across the mains through an inductive coil and an adjusted part of a small coil which is connected in parallel with the coil D. The inductances are made such that the currents in the coils C, D are in quadrature. The armature may be a conducting non-magnetic cylinder, with the coils C, D arranged crossways inside it. An additional coil parallel to the main current coil C, and connected in series with a non-inductive resistance across the mains, compensates for friction. Ordinary brake and counting devices are provided.

15,838. July 3rd, 1897. "Printing telegraphs." P. M. Justice. (A. H. Rowland.)—This relates to a printing telegraph system with a multiplex distributor working with alternating currents. Each complete signal consists of the modification, by inversion or omission, of two or more semi-cycles of the alternations of the current. The alternating impulses may be derived from any suitable source. The alternations are divided up into cycles of predetermined number, and every complete signal of the code adopted is completed with a cycle. Each transmitting station is provided with a number of branches corresponding to the number of elements of the cycle, and these branches are connected to a distributor by which the signals are transmitted to line. Various arrangements of these circuits are described, the preferable arrangement being that in which the makes and breaks occur in local circuits and affect the alternating currents of the main lines through a relay, the distributing action at the receiving station being also accomplished by means of a relay and distributor, the local circuits of which contain the requisite number of combination relays. The transmission may take place either by means of a perforated tape with one or several rows of perforations, or by a keyboard in which all the key levers operate a number of contact levers in the predetermined combinations. In this instrument a locking lever is provided for preventing the depression of a second key before the signal of a previous key is completed.

(To be continued.)

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

9,856. "Electric motor-generators." Electric and Ordnance Accessories Co., Ltd., and H. V. Bowen. April 24th.

9,925. "Fence, telegraph, and other posts." J. W. Morrow and B. Edwards. April 24th. (Complete.)

9,941. "Production of electrically insulating layers or coatings on metal." Spezialfabrik fur Aluminium Spulen und Leitungen G.m.b.H. (Addition to 20,634, 1910. Convention date, April 25th, 1910, Germany.) April 24th. (Complete.)

9,944. "Secondary galvanic batteries." H. P. R. L. Pörscke (commonly known as R. Pörscke) and J. A. E. Achenbach (commonly known as E. Achenbach). (Convention date, April 27th, 1910, Germany.) April 24th. (Complete.)

9,945. "Electrodes for secondary galvanic cells." H. P. R. L. Pörscke (commonly known as R. Pörscke) and J. A. E. Achenbach (commonly known as E. Achenbach). (Convention date, May 9th, 1910, Germany.) April 24th. (Complete.)

9,946. "Electrodes for secondary galvanic cells." H. P. R. L. Pörscke (commonly known as R. Pörscke) and J. A. E. Achenbach (commonly known as E. Achenbach). (Convention date, May 9th, 1910, Germany.) April 24th. (Complete.)

9,948. "Method of timing electromagneto machines for explosion motors and mechanism therefor." Societe Rene Gillet et Cie. (Convention date, November 25th, 1910, France.) April 24th. (Complete.)

9,957. "Single-phase commutator motors." B. P. Haigh. April 25th.

9,965. "Holders for incandescent electric lamps." A. Smith. April 25th.

9,968. "Process for the electrolytic production of metallic antimony from antimony ores or compounds." R. C. V. Whitfield. April 25th. (Complete.)

9,995. "Supporting or carrying fuses for electric circuits." E. A. Graham. April 25th. (Complete.)

10,038. "Trolley-wheels for electrically-driven vehicles." L. Pintner. (Convention date, August 4th, 1910, Austria.) April 25th. (Complete.)

10,043. "Telegraph transmitters." J. W. Mackenzie. (American Transmitter and Manufacturing Co., United States.) April 25th. (Complete.)

10,044. "Telegraph transmitters." J. W. Mackenzie. (American Transmitter and Manufacturing Co., United States.) April 25th. (Complete.)

10,045. "Impedance coils for telephony and like systems." E. A. Graham and W. J. Rickets. April 25th. (Complete.)

10,065. "Automatic gear for isolating faulty feeder cables by means of electrostatic apparatus." W. A. Scott and A. B. Croft. April 26th.

10,080. "Electricity meters." Chamberlain & Hookham, Ltd., and S. H. Holden. April 26th. (Complete.)

10,086. "Open-type arc lamps for use with cinematograph lanterns." H. Smithson and E. Ravenhill Sharpe. April 26th.

10,101. "System of and apparatus for wiring buildings and the like for the distribution of electricity." L. M. Waterhouse. April 26th.

10,105. "Relay device." A. Orling and Orling's Telegraph Instruments Syndicate, Ltd. April 26th.

10,113. "Non-interchangeable electric fuses." Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke G.m.b.H., Germany.) April 26th. (Complete.)

10,116. "Automatic disinfecting device for telephones." P. Z. Andronikoff. April 26th. (Complete.)

10,142. "Electrolytic cells." R. Threlfall. April 26th. (Complete.)

10,156. "Electrolytic cells." S. Benko. April 26th. (Complete.)

10,162. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) April 26th.

10,166. "Electric switch for use with a vacuum pump or for other purposes." A. J. Boult. (F. W. Van Ness, United States.) April 26th.

10,180. "Electrified steel tool." L. Leon. April 27th.

10,206. "Electric plugs." E. J. Stockwell. April 27th.

10,219. "Controllers for electric motors." J. Smith. April 27th.

10,231. "Electric furnaces." Rochling'sche Eisen und Stahlwerke G.m.b.H. and W. Rodenhauser. (Convention date, December 13th, 1910, Germany.) April 27th. (Complete.)

10,238. "Method of connection of lines in automatic telephone exchanges." Telephon Apparat Fabrik E. Zwietusch & Co., G.m.b.H. (Convention date, April 27th, 1910, Germany.) April 27th. (Complete.)

10,245. "Time control for electric alarm." S. T. Steel and J. A. Steel. April 27th.

10,254. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) April 27th.

10,264. "Electrodes for secondary galvanic cells." H. P. R. L. Porscke (commonly known as R. Porscke and J. A. E. Achenbach, commonly known as E. Achenbach.) (Convention date, July 12th, 1910, Germany.) April 27th. (Complete.)

10,266. "Spark-gap devices for wireless telegraphic and telephonic apparatus." E. Ballini and A. Tosi. April 27th. (Complete.)

10,290. "Electric arc lamps for alternating current." Korting and Mathiesen Akt.-Ges. (Addition to 26,706/09. Convention date, April 30th, 1910, Germany.) April 28th. (Complete.)

10,294. "Condensers." Heenan & Froude, Ltd., J. Bliss and A. B. Cleworth. April 28th.

10,303. "Manufacture of metallic-filaments for electric incandescent lamps." F. Hansen. April 28th.

10,309. "Electro-magnetically-controlled throttle valve." E. E. Bentall, G. C. Bingham and E. B. Gray. April 28th.

10,313. "Incandescent electric lamps." W. T. Baker. April 28th.

10,315. "Distribution of electrical energy." W. R. Rawlings and E. G. Nicholson. April 28th.

10,316. "Electric lighting systems and lampholders and connecting devices for use in connection therewith, or on ordinary systems." W. R. Rawlings. April 28th

10,317. "Distribution or supply of electrical energy." W. R. Rawlings and E. G. Nicholson. April 28th.

10,318. "Electrical switches or distributing devices." W. R. Rawlings. April 28th.

10,341. "Subscribers' instruments for automatic telephones." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) April 28th. (Complete.)

10,342. "Means for maintaining a constant speed in direct-current motors." Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke G.m.b.H., Germany.) April 28th. (Complete.)

10,358. "Electric incandescence lamps." Siemens Bros. & Co., Ltd., and W. H. le Marechal. April 28th.

10,363. "Electric jacquard apparatus." A. Regal. (Convention date, May 17th, 1910, Austria.) April 28th. (Complete.)

10,364. "Controllers for electric motors." J. E. Brown. April 28th.

10,375. "Electric lamp-shades, screens, or the like." J. H. Winter. April 29th.

10,379. "Slide chairs for railway switches." L. W. Williams. April 29th.

10,433. "Incandescent electric lamps and the mounting of same for illumination advertisement and the like purposes." J. Hubers. (Berliner Siriuslampen-Vertriebsges m.b.H., Germany.) April 29th.

10,434. "Means for fastening incandescent electric lamps to sheet-metal disks." J. Hubers. (Berliner Siriuslampen-Vertriebsges, m.b.H., Germany.) April 29th.

10,435. "Holders for electric incandescent lamps." J. Hubers. (Berliner Siriuslampen-Vertriebsges, m.b.H., Germany.) April 29th.

10,436. "Electric hair comb." J. T. Niblett and W. H. Cadman. April 29th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1909.

Manufacture of Separators for Use in Electrical Batteries and Electrolytic Apparatus. P. Marino. 30,602. December 31st. (Cognate application, No. 4,398 of 1910.)

1910.

Intercommunication Telephone Systems. G. Burney and F. G. Bell. 18,180. July 30th.

Sparking Plugs. L. Macquaire. 23,577. October 11th. (October 30th, 1909.)

Control of Alternating-Current Induction Motors. M. Milch. 23,958. October 17th.

Telephonic Instruments. F. Gottschalk. 28,396. December 6th.

Process for Electrically Sizing Paper. F. Arledter. 132. January 3rd.

Electric Heat-Conserving, Heating and Cooking Apparatus. G. G. Bell. 2,829. February 4th.

Fusible Cut-Outs. J. F. Conradi and E. S. Conradi. 7,823. March 31st.

Rheostats. A. Barry and G. W. Clarke. 8,274. April 6th.

Electrical Switches. J. H. Tucker. 8,375. April 7th.

Controllers for Electric Motors. Adams Mfg. Co. (Cutler-Hammer Mfg. Co.) 9,097. April 14th.

Electric Switches, Cut-Outs and the like. W. R. Trier. 9,153. April 15th.

Means for Facilitating the Transcription of Telegraphic Messages. A. Hurd. 10,745. May 2nd.

Telephone Transmitters and Relays. R. A. Fessenden. 11,602. May 10th.

Electric Wall-Plugs. S. W. Martyn. 13,274. June 1st.

Arc Lamps. H. E. Moul. 13,528. June 4th.

Electric Furnaces. F. A. J. FitzGerald. 15,166. June 23rd. (September 1st, 1909.)

Electromagnetic Apparatus for the Transmission of Power. G. W. Money. 15,422. June 27th.

Automatic Electric Cut-Out Switches for Electric Tramway System and the like. C. Winterhalter. 15,482. June 28th.